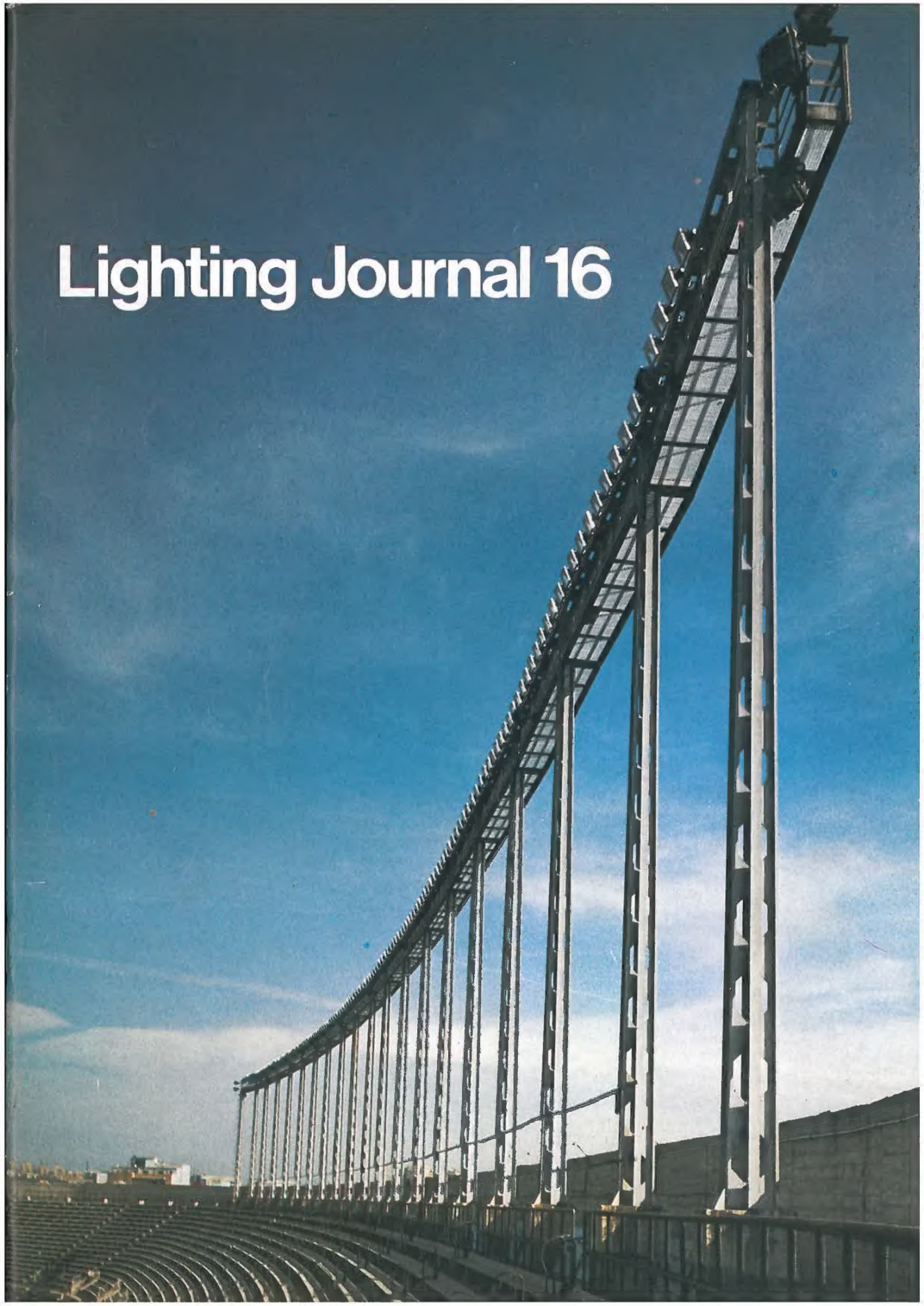
Lighting Journal 16



The Merchant Adventurers Hall at York, specially floodlit for the IES National Lighting Conference by the IES Yorkshire Region, using Thorn equipment.

Lighting Journal 16

Autumn 1976

If the contents of Lighting Journal sometimes seems somewhat varied this is because of the many activities of Thorn Lighting that it reflects. In this issue rather more emphasis than usual is placed on lamps. Three articles are devoted to them, one dealing with the metric 40W fluorescent tube — the latest addition to the fluorescent range, intended to solve difficulties imposed by the metrication of the building trade — one telling something of the many uses of miniature tungsten halogen lamps, and the third of the specialised light sources used in printing, photography and for curing epoxy resins. We have attempted to show how miniature tungsten halogen lamps are used for purposes as different as providing "psychadelic" lighting for a discotheque and to light an indicator to assist in the docking of supertankers: we have looked at the specialised lamps used for photographic and photochemical purposes.

Undoubtedly the highlight of the issue is the description of the lighting of the great Vicente Calderón Stadium at Madrid, for it is not only of considerable technical interest, but like the lighting of the Stockholm Underground described in the previous issue, an impressive example of the efficiency of the International side of Thorn Lighting.

The article on Programme 2 will be of interest to all those concerned with integrated ceiling design.

New legislation in the United Kingdom makes the article on Emergency Lighting timely, and the general unrest not only here but all over the world gives an added point to the discussion of Security Lighting contributed by two of Thorn's most experienced Lighting Engineers.

Of rather more specialised interest is the article on the Q-Master theatre lighting control system. Theatre lighting on the scale described is, perhaps beyond most of us, but there are many smaller repertory and amateur stages in which Thorn's electronic lighting control systems can be installed.

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Our cover picture is a daylight view of the lighting gantry at the Vicente Calderón stadium at Madrid, described in this issue.

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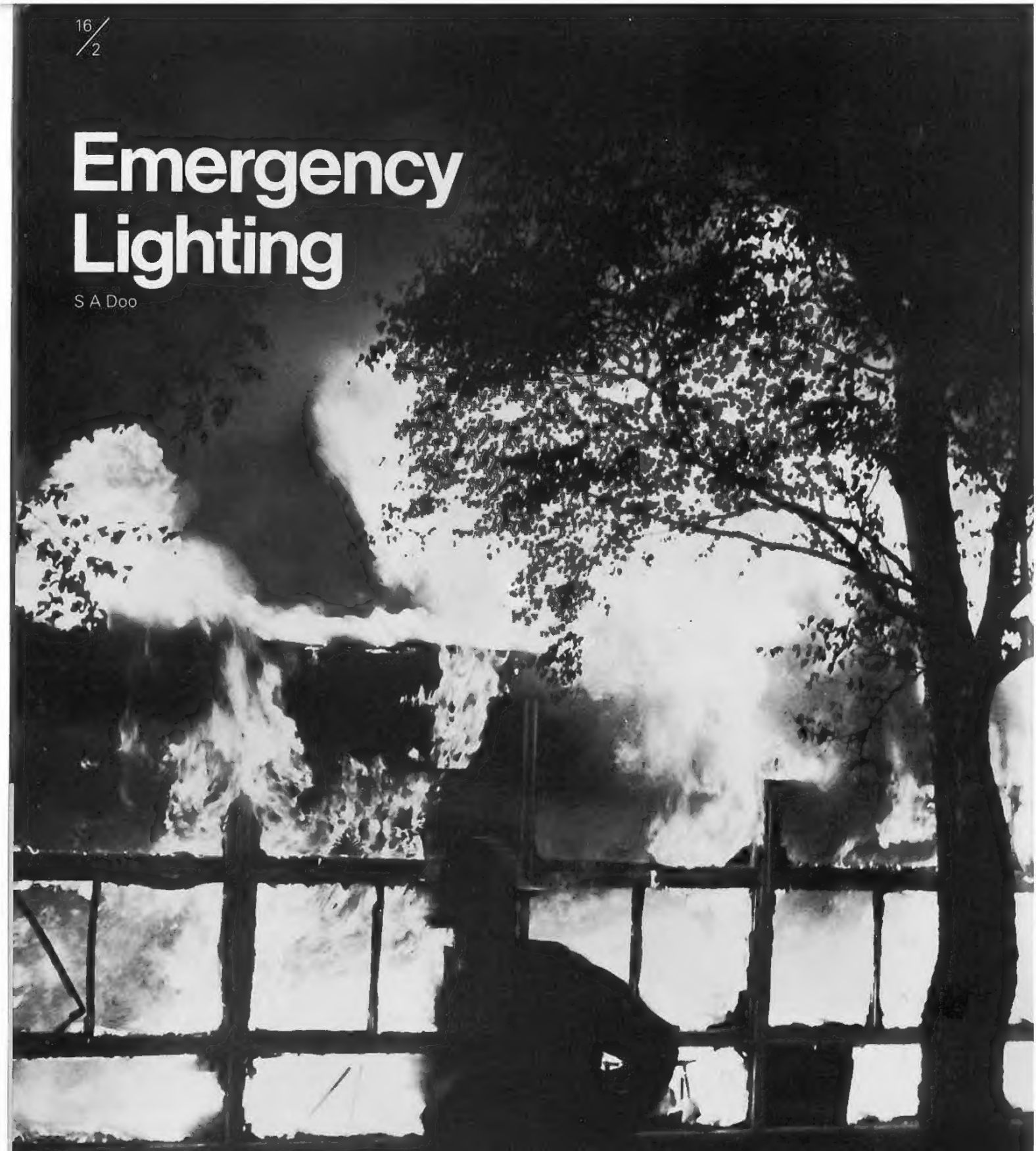
Emergency Lighting

S A Doo



Mr Doo is Product Executive for Emergency Lighting Systems at Thorn Lighting Ltd.

Escape Lighting — The very term is sufficient to set adrenalin flowing as it conjures up visions of high office blocks boiling up in the basement area and looking as if they are about to blast into orbit. Such events may mercifully be rare but the fact remains that millions of pounds are lost annually by fires and more tragically lives are lost because even the most elementary precautions are unobserved. These events happen in small isolated instances for the most part, it is only when a major disaster with considerable loss of life occurs that the national conscience is aroused. But to quiet this conscience effectively requires a national standard which can be applied to ensure that, whether at work or play, people are at minimal risk.

Legislation: British Code of Practise

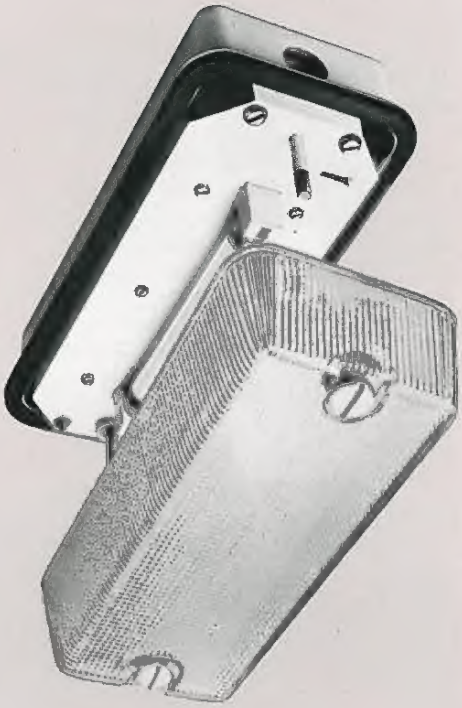
The Fire Precautions Act 1971 and more recently the Health and Safety At Work Act 1974 started to put teeth into legislation but still failed to lay down a minimum acceptance of illuminance, this was left to the discretion of the local Licensing Authority, democratic maybe, but hardly likely to produce

effective results in every case. In 1975 the BS 5266 (Code of Practice for the Emergency Lighting of Premises) at last provided this minimum standard, acceptable to all those responsible for designing, implementing and finally certifying installations. The application of the Code of Practice, which is not mandatory, is a matter of both common sense and sound professional advice.

A minimum illuminance figure of 0.2 lux is recommended as the lowest acceptable lighting level at the end of the specified duration period and with allowance for depreciating performance at the end of battery life. This minimum figure has already been criticised by some as being too low but was in fact derived from a series of practical experiments to determine how easily people of varying ages could move along a restricted passage avoiding obstructions. The fact that photometric data for spacing should be based upon luminaire performance alone adds to the safeguards for minimum performance. Additional benefit from intereflection from walls and ceilings, which can vary considerably throughout the life of the building, suggest that the usual minimum illuminance will probably be nearer 0.5 lux. A maximum diversity in illuminance levels of 40:1 is recommended so that the areas which have the greatest requirement for escape lighting, exit doors, staircases, fire appliance points etc. can be lit to a level of 20 lux from luminaires positioned over them. The statutory minimum will be perfectly satisfactory in most cases, in others obstructions and the complexity of the escape route will demand something much higher. It is here that the skill of the professional lighting engineers will be called upon in the application of existing luminaires and in the design of others for specific tasks.

Testing and Legal Responsibilities

Fire Officers, responsible for the issue of fire certificates, can only adopt a commonsense approach in their appraisal of completed emergency lighting installations. They are unlikely to have the expertise necessary for the measurement of low illuminance even assuming that the equipment is available to them and will ask for a written guarantee that the installation meets with the local standard requirements, usually to BS 5266. This places a heavy responsibility on the shoulders of the installing contractor, who will in turn look to a reputable manufacturer for technical advice and a guarantee that the available equipment is designed and manufactured in accordance with the requirements of BS 5266 and subjected to the most stringent performance tests.



A weatherproof bulkhead fitting incorporating a 150 mm 4W fluorescent tube. The compact arrangement of the control gear and nickel cadmium battery pack can be seen below it.

The final legal responsibility for safety rests of course upon the building owner or occupier, but such is the insistance on quality of many fire officers that they will only accept a contractor on a nationally approved list as a satisfactory installer.

Planning the Installation

Emergency lighting points and change of direction signs should be positioned to indicate exits and hazards such as steps, ramps or changes in floor level. An illuminance of up to 20 lux is permitted at such points. All that is now needed is to ensure that the illuminance on the centre line of the escape route does not fall below 0.2 lux or 2.5% of the maximum illuminance at any point. Luminaires should be chosen for their suitability for the job, basing the choice on considerations of performance and appearance, and should be so placed on the route that they indicate the line of escape.

Isolux diagrams for the luminaires at various mounting-heights will provide enough data for this. More elaborate calculations are unnecessary, but if the steps in lighting design seem too simple, it must be recalled that they are the result of careful research, development and testing of luminaires, and can be used with confidence.

Types of Luminaires

Emergency lighting luminaires fall into two main categories — those fed from a centralised power system and known appropriately as slave luminaires and those having small rechargeable batteries, powered by trickle chargers fed from a permanently connected electrical supply.

Both types may operate in maintained (permanently lit) or non-maintained (lit only in the event of a mains failure) mode and contain miniature lamps or low wattage tungsten lamps.

Slave Units or Self-Contained Luminaires?

Central operation offers a number of advantages. The luminaires can utilise simple inverters for fluorescent lamps or use the even simpler tungsten filament lamp with its lower efficacy. Testing is a relatively easy operation and because the maintenance required is of a skilled nature it is generally to a high and therefore reliable standard. A major operation requirement of emergency lighting, however, is to sense a sub-failure rather than that of the mains supply. This can be achieved from a central point via local relays but it introduces other possible failure points into the system. In addition the circuit wiring has of necessity to be heat-resisting since local failure from fire damage could immobilise the complete installation. Central systems tend therefore to be expensive, requiring special plant rooms and skilled attention.

Self contained luminaires on the other hand require no special wiring since local interruption in an electrical supply will affect only these units fed directly from the area affected. Zone

control is easily achieved through local distribution fuse-boards which can be easily added to an existing installation, but testing the system presents some difficulties, as described below.

The illustrations show how neatly components can be fitted into standard housings ensuring visual continuity between standard and escape lighting luminaires, but although it is a simple matter to bring together the components for a self-contained luminaire once the optimised electrical circuit has been designed, the major worry is that of the battery operating temperature.

Battery Operating Temperatures

Ambient temperatures within the luminaires must be kept at or below about 30° C as nickel-cadmium rechargeable batteries have a much reduced performance above that temperature. A rise of 50°C on the battery case for instance, leads to a reduction in charge acceptance of about 25% which seriously affects the duration capability of the luminaire. Since it may only be operational under emergency conditions its unreliability will only be apparent when it is too late and it may fail at a critical time.

In the maintained condition, with lamps operating all the time, internal temperatures can rise causing premature failures, but operation in a non-maintained mode has few temperature problems since the total circuit energy at any one time is relatively low.

Because battery power is limited, miniature fluorescent lamps or low wattage krypton filled tungsten lamps are used to ensure maximum efficiency and the electrical circuit is critically designed to ensure optimum light output for minimal battery drain. It is important that a normal duration (operating) period of 3 hours should be maintained even at the end of the rated life of the battery.

Testing Self-Contained Luminaires

Testing presents no problems in a centrally controlled system, but it is more difficult where self-contained luminaires are concerned. It is however a fundamental requirement of BS 5266.

Dealing with each unit individually is not impossible, but it is time consuming and hence expensive. A better way is to feed groups of luminaires from a local switchboard by means of a retractable link or keyswitch. This provides the means of simulating mains failure of a number of units rather than dealing with each individually.

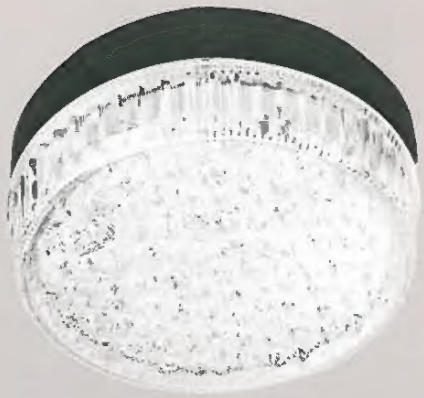
Stand-by Systems

So far the emphasis has been on emergency lighting for escape purposes and this will continue to be a dominant sector of the market. Many industrial and specialised installations, hospitals, old peoples homes etc. require standby lighting to ensure that, in addition to adequate escape facilities, sufficient light is provided to enable vital processes to continue. Invariably these must be fed from a central source since the energy required is beyond the capacity of batteries housed within luminaires.

Conclusion

Soon the provision of emergency lighting will be as normal a part of the mechanical/electrical services design programme as the ordinary interior lighting. Although hotels and boarding houses were the first building classifications to come under scrutiny, all buildings apart from private dwelling houses will eventually need to conform to a minimum standard.

The manufacture and marketing of escape lighting equipment is likely to become big business, but underlying all the commercial considerations is the fact that if the equipment involved is neither maintained properly nor completely reliable in operation, lives could be at stake. Like all forms of insurance, Emergency Lighting is one which it is fervently hoped will never be needed although its use may be prompted by nothing more sinister than a blown fuse. As with insurance, however, the astute inquirer will read between the lines to see the degree of protection guaranteed; a judgement based on cost alone could be disastrous.



The external appearance of Thorn self-contained non-maintained emergency lighting luminaires matches that of standard fittings. Below, one is mounted near an exit.

The orderly appearance of the Clipper lighting equipment at King Taudevin and Gregson's office at Sheffield compared to the original installation (below). An advantage of the Clipper system is that it allows important areas to be highlighted without disturbing the arrangement of luminaires or drawing boards.

A Clipper Installation

Use of 'CLIPPER' fittings reduces both capital and installation cost of lighting a drawing office.

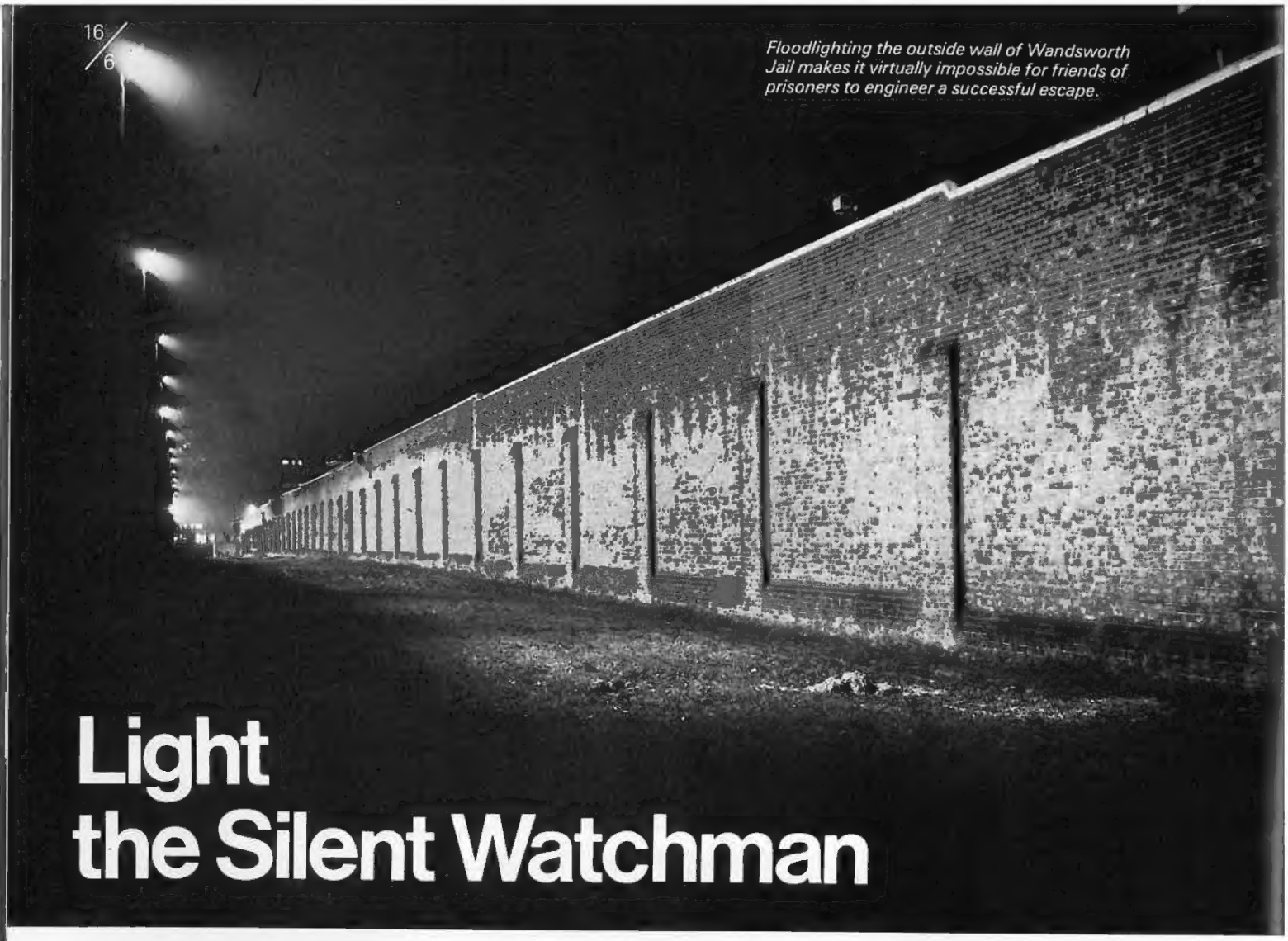
The drawing office of King, Taudevin & Gregson Ltd of Sheffield was lighted by a heterogeneous collection of fluorescent reflectors and opal spheres containing filament lamps hung on chains over the drawing boards a little above head height. Although this provided adequate illumination at the working points, it was untidy, resulted in great diversity of illumination, cast heavy shadows and limited the number and position of the boards in the room.

It was decided to substitute a general lighting scheme, consisting of luminaires mounted on trunking directly below the roof trusses, an illuminance of 700-750 lux was specified and twin 6' 0'' 75W fluorescent fittings with prismatic controllers were chosen to reduce direct glare.

Two alternatives were possible: to use Clipper twin luminaires on Clipper trunking, or Popular Pack twin fittings mounted on Liteline Trunking. In both cases prismatic controllers were specified to reduce direct glare. The slightly wider spacing possible with the Clipper fittings allowed 25 instead of 33 luminaires to be used, without a fall-off of illuminance between the rows of fittings. Illuminance on the horizontal working plane was very little different (700 lux as opposed to 750 lux). The use of the Clipper fitting gave greater flexibility; they can easily be moved on the trunking, and single lamp fittings substituted for twin lamp ones in circulation areas.

The total cost of fittings and trunking in the Clipper scheme was £726.20 including tubes, saving nearly £170. The cost of installation was also reduced, since Clipper fittings are more easily installed on Clipper trunking than any type of conventional fluorescent fitting.

The electrical contractors were the Delph Electrical Co. Ltd, of 69 Sorby Street, Sheffield 4, and the whole job took only days to complete.



Floodlighting the outside wall of Wandsworth Jail makes it virtually impossible for friends of prisoners to engineer a successful escape.

Light the Silent Watchman

Notes on Security Lighting by
D Wilkinson and R Aldworth

Mr Aldworth is Senior Lighting Engineer at Thorn Lighting Ltd, and Mr Wilkinson is Chief Lighting Engineer at Belfast.

Of all the security devices available, ranging from a chain link fence to a burglar alarm and from supersensitive sound detectors to closed circuit television, only lighting has the advantage of acting as a constant deterrent. Thieves and other intruders prefer the security of darkness, and even if they can disconnect the lighting the very fact that it has gone out will alert the guards to the fact that something is wrong. Security lighting deters would-be intruders from attempting an entry, putting them at a visual disadvantage by subjecting them to glare and leaving them uncertain as to the whereabouts of the defenders. Its merit is recognised not only by those responsible for protecting military objectives but by most insurance companies, who are prepared to charge lower premiums when the security of the site is good.

The effectiveness of security lighting is not only limited to its deterrent and detective effects on crime or political attack. A well lit site allows security guards and other members of the staff to move about with confidence and safety, and thus improves morale. It has been estimated that the annual cost of theft in the UK is £66m but it is likely that the cost of accidents in terms of personal injury and damage to plant and premises occurring on ill-lit sites costs as much again. Neither are the benefits of security lighting limited to industrial premises. In public areas such as pedestrian precincts, town centres, car parks and recreational areas, lighting will improve standards of security and general safety but in some cases the design approach will need to be more decorative than for industrial areas.

Public Buildings

Museums and art galleries are a tourist attraction, but they also attract criminals. Churches and cathedrals unfortunately hold a fascination for the desecrating vandal and therefore need security lighting which may well take the form of decorative floodlighting.

The lighting design must be related to the type of surveillance used on site and complement the other defences. The type of lighting installed depends on such factors as the likelihood of the premises being broken into and the value of the resulting loss. The security staff is usually on the inside looking out, so that the situation is complicated when the floodlights are directed towards the building and consequently towards its defenders. However if staff viewing positions are fixed, the floodlights can be aimed and, if necessary, screened so that adequate viewing conditions can be achieved.

Importance of Backgrounds

Providing direct lighting onto an intruder is obviously effective, but there are occasions when he can use camouflage, blacking his face and wearing clothing which blends with his background. If he is revealed in silhouette against light coloured surfaces, there is no way in which he can achieve the invisibility he would prefer. Whenever possible, light coloured surfaces should be used on all buildings, walls, fences, roads and surfaced yards to reveal the criminal "in a better light".

Seeing Without Being Seen

The idea of revealing the intruder without him being aware that he is being watched seems very obvious, but how often is the opposite achieved? A brightly lit gatehouse is an example of ineffective security lighting which raises the eye adaptation of the guard so that it is difficult to see out of the windows and this difficulty is increased by the fact that the lighting equipment is also reflected in the windows. All this allows the intruder to see exactly what the guard is doing.

The lighting of this lorry park at Charringtons Bottling Plant at Runcorn aids security as well as providing useful illumination. Below can be seen how area floods mounted on the walls of a building can assist guards to see the ring fence but provide a glare-source to intruders.

The lighting level outside the gatehouse should always be higher than that inside it, and desk lights should be carefully screened to avoid glare to the occupants.

Industrial, Military and Similar Locations

Perimeter fences usually take the form of a chain link fence 3-8m high, at some distance from the building. To the determined intruder or escaper, they only hinder movement but the time required to negotiate, or penetrate a fence make this an ideal place for security staff to observe suspect activities.

The basic design objectives for security fence installations are:

(a) To act fully as a deterrent, the lighting should be switched on throughout the hours of darkness.
(b) The luminaires should be on the inside of the fence and light it over the entire length so that no point on the fence is outside at least the 1/10th peak beam angles of adjacent floodlights.
(c) Luminaires should have sharp cut-offs so that security patrols are in darkness and their positions (or existence) is invisible through the glare of floodlights to persons outside the fence.
(d) The fence should be dark in colour to prevent reflected light illuminating security patrols. This also applies to chain-link fences, which if light in colour can prevent the defenders detecting the approach of attackers on the outside of the fence. Alternatively extra lighting could be provided outside the fence.

The average vertical illuminance (Ev) at the fence should be 30-50 Lux, horizontal illuminance having no significance.

Experience has shown both in the UK and North America that this figure is, to date, sufficient to deter or detect intrusion.

Area Floodlighting

Locations such as factories which have either large exterior circulation and storage areas within their boundaries, or directly adjoining roads and housing have to rely either on area floodlighting, using normal floodlights, or else on normal streetlighting techniques.

Design considerations vary greatly from one site to another; vertical illuminance is the important factor, but must be provided with minimum glare to security guards, adjoining property and roads. This can generally be achieved by using floodlights with a fan shaped beam with an asymmetric distribution in the vertical plane giving a fast run-back above the peak. It is important to position the floodlights to prevent the formation of deep shadows in which an intruder can hide.

Average vertical illuminance should be 5-10 Lux measured in a plane facing the defenders position.

Closed Circuit Television

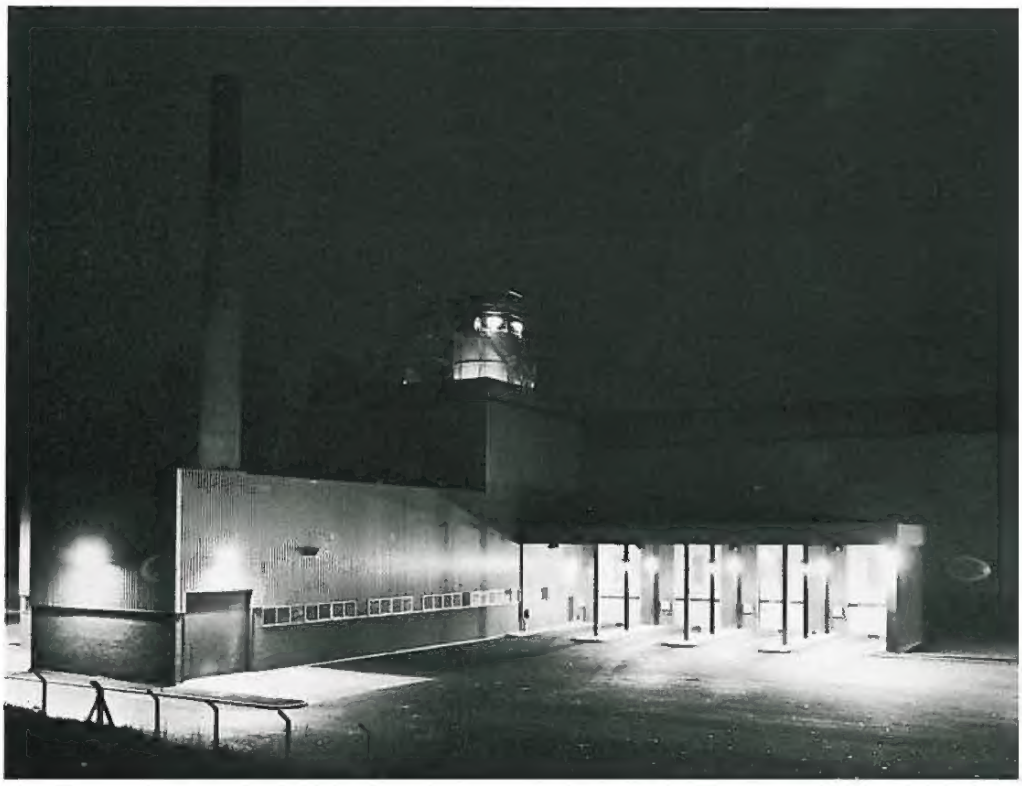
Closed circuit television (CCTV) is frequently used in industrial premises. It is essential that the required luminance be provided in planes normal to the camera lens. The most economical method is to arrange, where possible, for the light sources to be placed close to the camera position ensuring:

(a) that illumination is provided over the entire area covered by the pan and tilt controls of the camera
(b) sufficient beam cut-off to prevent lens 'flare' at other camera positions.

Where large areas are to be viewed it may be advisable, on economic grounds, to reduce the luminance recommended for the particular camera by up to 50% and over-run the camera tubes. The additional costs can be much lower than those of a floodlighting system which fully meets the camera specification.

Cameras Sensitive to Infra-Red Radiation

Considerable improvements have recently been made in designing cameras for operation in infra-red



Below. Lighting building sites can provide good security as well as speeding production.

STARTING AND RE-STARTING TIME OF LIGHT SOURCES				
Run-up time from 'cold' to 90% of full light output	Re-Striking Time when "Hot"			
	Instantaneous	Less than 1 minute	Less than 4 mins.	2-7 minutes
Instantaneous	Tungsten Tungsten Halogen	—	—	—
5-7 minutes	—	High Pressure Sodium (with electronic ignitor)	—	Mercury Metal Halide
7-9 minutes	—	—	—	High Pressure Sodium (with internal starter)
6-11 minutes	—	—	Low Pressure Sodium	—

"light". Detailed pictures can be obtained at a range of over 400m at night using one 300W infra-red source mounted on the camera. It is essential that the infra-red source emits no visible radiation and that "instantaneous" floodlighting be installed to illuminate unlawful activities after they have been detected by the camera.

"Twin System for Closed Circuit Television"

The major drawback of infra-red camera systems, when they are the sole means of security, is the loss of the deterrent effects of continuous, visible, floodlighting, so an alternative method is to use a twin system which combines visible light, for normal viewing and as a deterrent, with infra-red radiation, for closed circuit television. The general lighting for the area can be selected without taking into account its suitability for CCTV and then the optimum camera/infra-red lighting combination can be employed.

Choice of Light Source

As with most lighting applications the choice of light source is a fundamental design decision. It is not only tied up with considerations of initial cost of equipment and installation, but the colour quality of the lamp is significant as well as its physical and electrical characteristics and those of its associated control gear. Many of these factors are also involved in the choice of floodlights apart from the Infra Red system already discussed.

Not all light sources are equally suitable for closed circuit television. Recent tests with silicon camera tubes (the most commonly used type) have shown that at 20 lux the preferred light sources are metal halide and high pressure sodium. Low pressure sodium requires approximately doubled illuminance for equivalent viewing, thus losing the advantage of its high luminous efficacy. The use of MBF is not recommended, since it provides poor quality pictures and has lower efficacy than both metal halide and high pressure sodium.

The main problems with tungsten halogen are the low efficacy of the lamp and its high output in the infra-red wavelengths. The silicon camera tube has a peak sensitivity in the near infra-red region, this may result in blurred pictures due to "flare" and poor focusing due to the different focal lengths of visible and infra-red rays in the camera optical system.

There are obvious economic advantages for using discharge lamps, but they all take some time to reach full light output after switching on, although in most security installations the lighting is switched on at dusk and runs continuously through the night.

A more important point is the time taken to re-light after a break in the supply. This varies considerably between different lamp types. (See table). The high pressure sodium lamp restrikes faster than any other discharge lamp, which largely explains its extensive use in security lighting. Tungsten halogen lamps are used for standby lighting to cover long or short periods of power failure, and to provide an instant flood of light in the case of a suspected break-in.

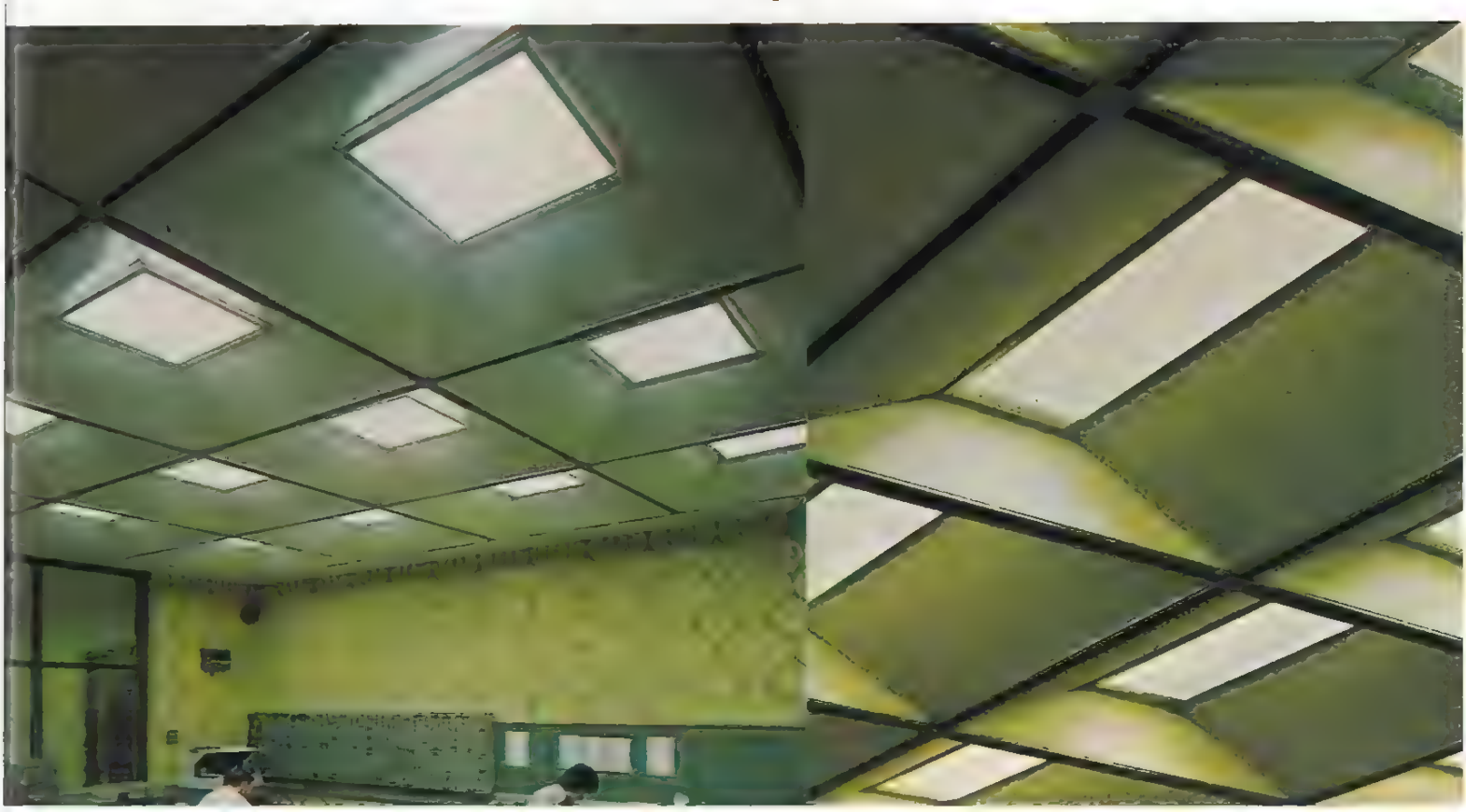
The lighting equipment used for security lighting includes many standard group A and B street lighting lanterns, most dispersive and many projector area floodlights, and wellglass and bulkhead fittings to fill in local areas of shadow. The equipment should be selected for its reliability and ease of maintenance throughout the expected life of the installation and needs to be of robust enough construction to resist any attempt to put it out of action.

Contrary to the impression some people have, lighting always has been one of the cheapest commodities, and continues to be so even in these times of ever increasing costs. When applied to the security of sites and premises, lighting is not only cheap to install and run, but it can save money, heartbreak and life.

Programme 2 Makes Good Progress

M J H Pinniger & H C R John

Miles Pinniger is manager of Thorn Lighting's Ceiling Systems Department and Hugh John is Project Manager in the Department.



Programme 2, Thorn's new integrated ceiling system, first described in Lighting Journal Number 14, has made rapid progress in spite of being introduced at the beginning of a period of national financial stringency. The concept of square modules with a choice between a 1200 mm and 1500 mm has appealed to architects and designers in relation to current ideas of space planning and the interior environment. A wide variety of ceiling shapes and textures can be achieved, without recourse to specially designed components. The unique appearance of the moulded coffer has proved a welcome alternative to previous designs and the well thought out air handling facilities have also contributed to the success of the system.

Experience in the last year has more than justified the design brief set for the system and the emphasis placed on the necessity for planning at an early stage. Detailed drawings showing how the system will be applied and its relationship to the building structure and other services are extremely important. The briefing of the various trades concerned with the installation of the system and its subsequent operation is also essential. Careful planning ensures that work on site progresses quickly and smoothly.

Naturally, the proof of any design is in its use and the system has stood up well to the tests of installation and operation in all projects carried out to date. Much of this is due to the thorough trials which preceded the launch.

Programme 2 Steel Coffers

Although the moulded coffer has proved popular, it is only one out of six infill types available for each module size. Another is the steel coffer, that was used for the first time in a branch of the National Westminster Bank at Plymouth. This is a four-piece pyramid shaped coffer which is made from plain or perforated steel sheet at our Spennymoor factory. It costs less than the moulded coffer and like it, accepts and supports both Kolorformat and New Format luminaires. It can also be converted into a "blind" unit by fitting a 600 x 600mm infill panel. The perforated steel version is fitted with acoustic absorbent pads and its white stove enamelled finish makes for easy cleaning during maintenance.

Linear Coffers and Clipper

The original concept for Programme 2 led to the adoption of 600 x 600mm square luminaires either in discharge or fluorescent form. In some situations however, a preferred direction to the module is desirable. This can be achieved without disturbing the basic geometry of the system, by using a linear luminaire in a square 1200 x 1200mm or 1500 x 1500mm module. With the introduction of the Clipper range of luminaires, a new design of linear coffer has become possible using a single or twin 4' 40W standard Clipper located in a 1500 x 1500mm Programme 2 module.

Air handling is achieved by a special slotted type reflector plate allowing return air to pass around the Clipper lamp and spine and into a negative pressure plenum above. As in the type using recessed luminaires the coffer is formed by supporting the air handling top plate on two stove enamelled steel coffer ends which rest on the grid. The assembly is completed by two side panels which can be of mineral fibre board or perforated steel. The use of the standard Clipper luminaire gives maximum simplicity at minimum cost.

The first installation of "Clipper coffer" will be at the new Eastern Electricity Board Showroom, Arndale Centre, Luton to be completed shortly. As the most economical version of Programme 2, it is anticipated that this

The top picture on page 9 shows the Midlands Electricity Board's showroom at Wolverhampton lighted by three-lamp U-tube luminaires set in a moulded coffer ceiling. Below it is the machine-room of the National Westminster Bank, Plymouth where similar luminaires are used in metal coffers, and a section of a ceiling showing Programme 2 linear coffer fittings.
On this page is shown a flat ceiling treatment (below) and two stages in the installation: taping up the joints in a linear air bar diffuser and locating a moulded coffer.

will appeal to a wide section of the integrated ceiling system market.

The Linear Air Bar Diffuser

Of the three air diffusion systems offered with Programme 2, the Linear Air Bar diffuser is unique and is proving very successful in practice. An integral linear diffuser and continuous distribution duct which can be installed in lengths of up to 10m in main grids, it dispenses which a great deal of the branch ductwork, lagging and flexible connections required with conventional diffusers. Because it also reduces site labour to a minimum, practical experience shows that its use can achieve savings of up to 40% in installed costs. The Linear Air Bar has been employed in a number of Programme 2 schemes in all of which its use has significantly reduced the problems of site commissioning.

Use of the 40 Watt U-Tube

The new 40W fluorescent U-tube introduced earlier this year is now standard in the 600 x 600mm New Format luminaire. In two or three-lamp luminaires, this tube gives a superior performance to the original 2' 20W straight tubes at a lower cost. In addition to a 50% increase in life (now 7500 hours), the U-tube gives above 17% more light output for the same power consumption as a pair of 2' 20W lamps. Due to the reduced volume of the 1" diameter tube, the electrical loading of the lamp per square cm of sectional area is higher than its 4' 40W, counterpart and it performs very well in air handling luminaires. When exhausting air into a negative pressure plenum the three-lamp 600 x 600mm troffer can give up to 24% increase in light output and achieve 85% recovery of heat from lamps and control gear. Because the modular positioning of the luminaires in a rigid pattern in Programme 2 dictates the number that can be installed, two and three-lamp versions can be used together as a means of adjusting average illuminance.

Most of the Programme 2 projects requiring fluorescent lighting now use the U-tube, and it has so far been incorporated into installations at Glasgow, (Scottish Amicable), London (Oyez House), Stratford-on-Avon and Wellington (MEB) and Plymouth (National Westminster Bank).

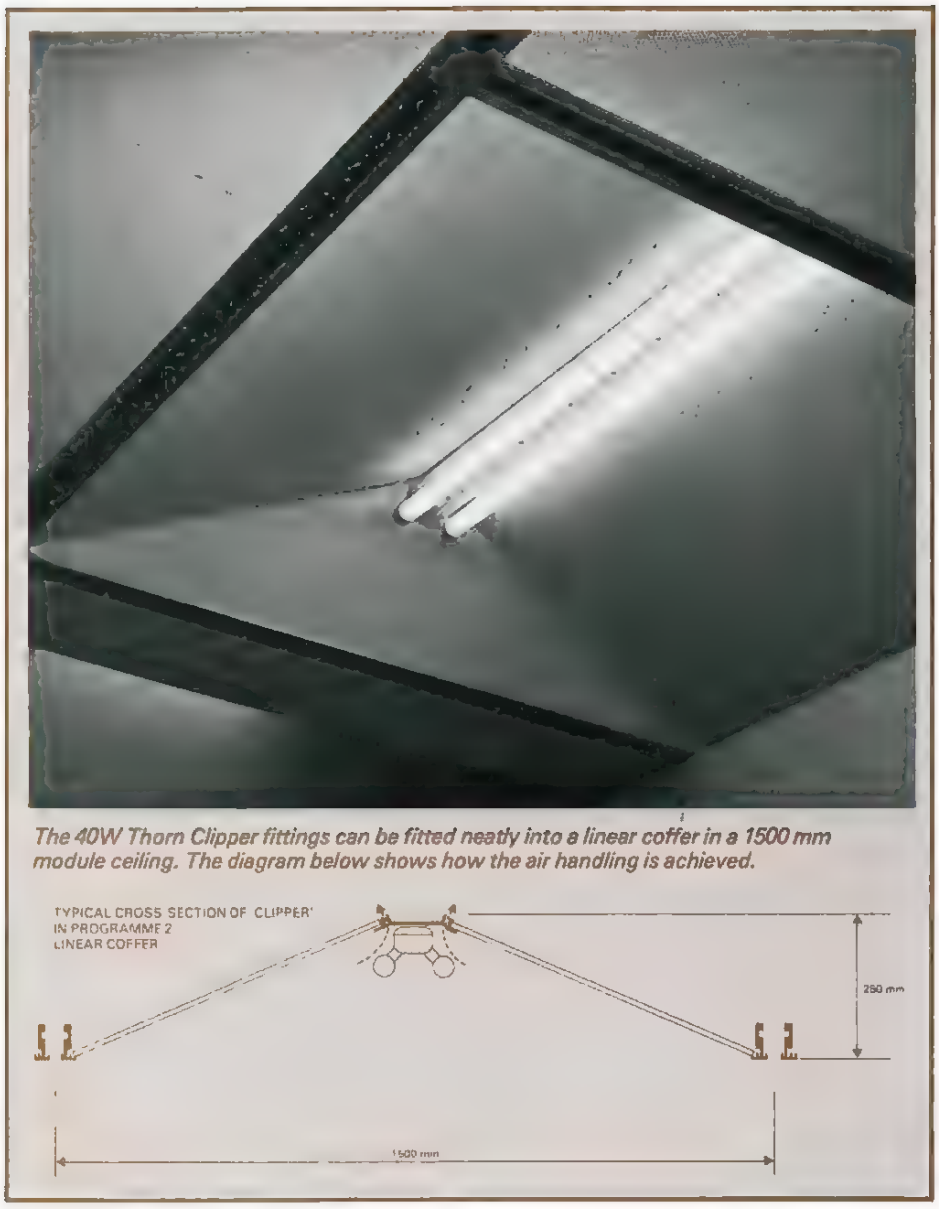
Variations in Design

The development of Programme 2 has not only given Thorn Lighting engineers a flexible design which lends itself to special applications but also the expertise to handle complete designs for the occasional one off project. One example of a special application of Programme 2 is being installed in an office block in the City of London. Here the system is completely standard except that it is to a one metre square module. The aluminium grid, the basic framework of the system, readily accommodates this kind of modification and only the moulded coffers required special tooling. This project has also demonstrated the ability of the grid to marry up to proprietary variable volume ceiling diffusers, in this case Carlyle Moduline.

Another example of the ability of Programme 2 to accept modification is a design that the Company has put forward for the use of the system in a semi-exposed position. Despite the fact that it has to be able to withstand the effects of wind, rain and atmospheric pollution, it has only proved necessary to secure the coffers and upgrade the finish of some of the components, the basic design being perfectly adequate for this situation.

The expertise gained from the development of Programme 2 proved to be invaluable in designing a special system for the new offices of the Central Electricity Board at Harrogate. The Board's brief called for 3200mm x 1400mm coffers using 6' 85W lamps. Support grid for these units is a modified form of the standard grid with an "H" cross section. The coffers themselves are manufactured from perforated steel on principles developed for the Programme 2 steel coffer.

The design brief of Programme 2 was produced with the aim of making the system flexible and able to meet a wide range of requirements found in practice. A number of installations are now complete and in successful operation whilst others will be finished within the next few months. Experience of those in operation has confirmed that the system fully lives up to expectation, and will contribute to a new era of ceiling system design.



The 40W Thorn Clipper fittings can be fitted neatly into a linear coffer in a 1500 mm module ceiling. The diagram below shows how the air handling is achieved.

Lighting the Vicente Calderón Stadium

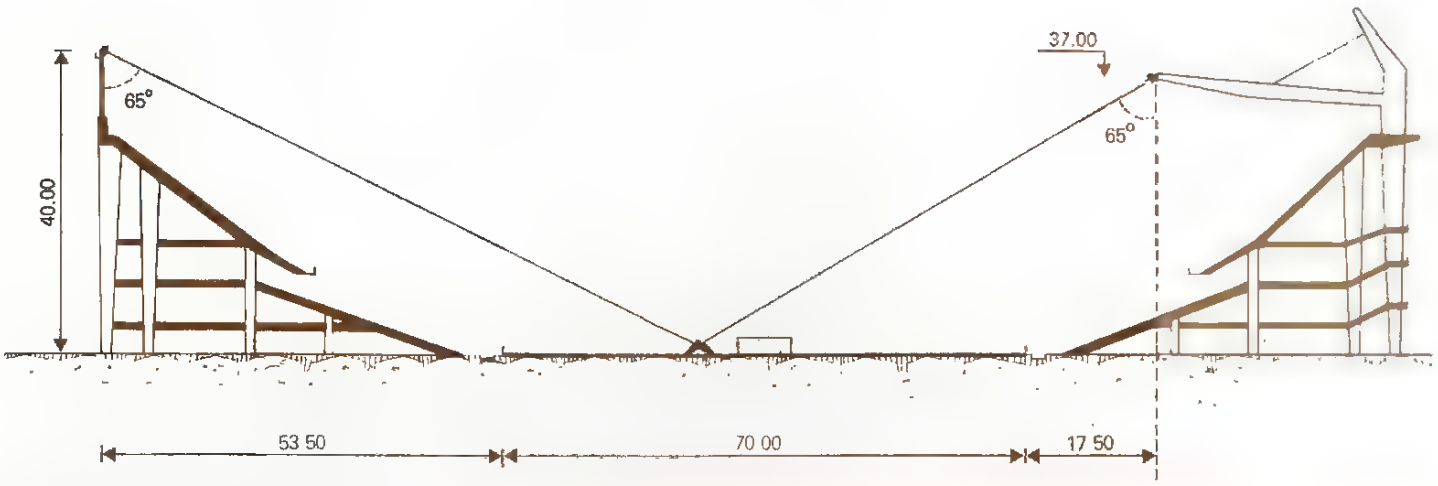
P W J Holley

Mr P W J Holley is a Planning Engineer in the Thorn Lighting International Division Lighting Advisory Department — Romford.

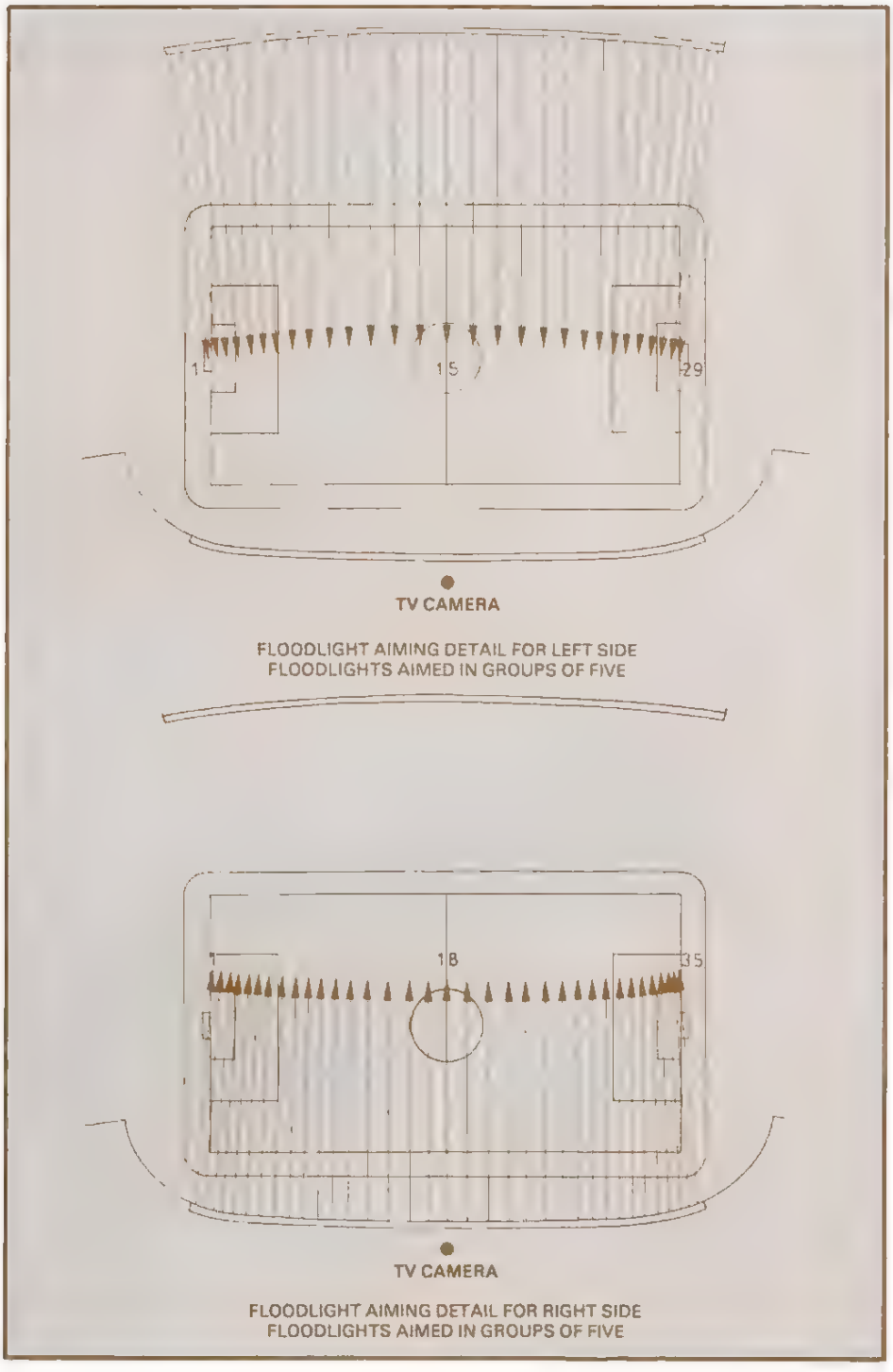
Vicente Calderón Stadium — Madrid

During 1976 a number of very important European cup matches were scheduled to be played and televised in Madrid, together with the first leg of one of the quarter finals of the European Nations Cup in which the national Spanish side were to play against West Germany. In addition to this, Spain is to be the venue for the World Cup series in 1982, with the possibility that this date might be brought forward by four years if Argentina were unable to stage their series in 1978.

An aerial view of the magnificent stadium of Atletico Madrid showing a game in progress. The evenness of the lighting on the pitch is clearly shown. Below can be seen how floodlights were mounted on the front of the stand roof, and the unusual use of a gantry along the opposite side.



A cross-section of the ground showing how the floodlights were aimed to provide even illumination and avoid glare to players and spectators. The diagrams right show how they were spaced apart in the centre of each row to avoid overlighting the centre of the pitch. On the opposite page is a row of floodlights on the edge of the stand roof. Every fifth floodlight is tilted down to illuminate the adjacent touchline area.



The magnificent modern stadium "Vicente Calderón" was selected as the venue for the very important European Nations Cup game against West Germany on the 24 April 1976. The stadium has a capacity of 70,000 people, all seated, and belongs to Club Atletico Madrid, which with Real Madrid and Barcelona is one of the three most successful football clubs in Spain.

The Decision to Re-Light

The existing lighting system, consisting of 700 1kW tungsten halogen floodlights mounted on the stand roof and on a special gantry opposite it, providing 500 lux horizontal at pitch level, was inadequate for good quality colour television transmissions. Therefore, Club Atletico decided to relight the stadium to Spanish Colour Television transmission standards. These require an average illuminance of 1600 lux in a plane normal to the principal TV camera position with an illuminance gradient of less than 5% in one square metre.

The club put the scheme out to tender and Thorn's Spanish Agent, C & G Carandini, working with a local installation contractor produced an outline design based on their knowledge of Thorn floodlights. The existing mounting positions on the front edge of the stand canopy and the purpose built gantry were to be used. They proposed use of the Thorn ON1600 floodlight with its asymmetric fan shaped light distribution. This floodlight was specifically designed for

side lighting installations in stadia and its fast run-back above its peak intensity ensures good glare control at both low and high illuminance levels. It was to be used with the 1600W MBIL/H linear metal halide lamp for which it was originally designed, which has a initial lumen output of 135,000 lumens, and has a proven acceptance of its colour rendering properties for colour television transmission. Descriptions of the use of this floodlight at a number of British Stadia including Wembley, may be found in Lighting Journal Nos 6 and 10.

Thorn Secure the Order and Deliver the Goods

In the face of fierce international competition, C & G Carandini secured an order for 320 Thorn ON1600 floodlights on the 10 March. The floodlights had to be positioned and working by the 7th of April, which allowed 27 days for the whole job, including the removal of the existing floodlights to be completed.

Immediately the order was received in London, John Clarke, the Thorn Area Manager for Spain, arranged for despatch of the floodlights from the International Division's warehouse at Romford.

Technical Assistance.

The Thorn International Division's lighting advisory service department at Romford then gave C & G Carandini technical assistance in determining the positions of the floodlights and their angular adjustment. Using their considerable experience in the design of this type of lighting for stadia around the world they carried out calculations to ensure the prerequisite average illuminance level of 1600 lux normal to the principal TV camera position. Taking into account the greater distance of the floodlights on the lighting gantry from the pitch centre compared with the floodlights on the canopy roof it was decided to bias the lighting in the camera viewing direction in the proportions of 175. floodlights on the canopy roof and 145 floodlights on the lighting gantry.

The floodlights on the stand roof are mounted at 37m and those on the gantry at 40m above pitch level.

Having determined the angular adjustment of the floodlights, use was made of the computer at Leicester to confirm the critical calculations. So great was the urgency for this information that a C & G Carandini director flew to London on the 17 March and accompanied the writer to Leicester. The results from the computer giving the illuminance level values on the football pitch based on the 77 point Union of European Football Associations (UEFA) illuminance grid and confirming the floodlight positions, were telexed to C & G Carandini from Leicester on the 18 March. By this time the contractors had cleared away most of the old floodlights. Installation work was started immediately and continued non-stop until the lighting system was completed.

Some Special Considerations

As angular adjustments in azimuth were required in some floodlight positions, special brackets having two floodlight fixing holes for added stability, were used to mount the 1600 floodlights, the downward vertical angular adjustment of which was taken care of by the stirrup assembly. In order to prevent the build-up of light in the centre of the pitch which normally occurs when floodlights are mounted in long rows, the floodlights were spaced further apart in the centre of the row ranging from 0.9m at the centre to 0.5m at the ends on the canopy stand roof and from 1.1m at the centre to 0.7m at the ends of the row on the gantry.

The electrical contractor arranged for adjacent floodlights to be fed from separate sub-stations, ensuring that in the event of an electrical failure at least half of the lighting is maintained. In the event of complete failure of one sub-station, the whole load would be switched to the other for the duration of the match.

The Job is Completed in Time

The whole installation was completed, tested and switched on in time for a match between Atletico and a local team on April 8 and it was enthusiastically reviewed in the National Press the following day. The new lighting system achieved a 16% reduction in electrical load and a 314% increase in the lighting level. Only 28 days elapsed from the receipt of order to the first match played and televised under the new lighting. A remarkable achievement by any standards, and a tribute to the excellent team-work of C & G Carandini, the Contractors and Thorn Lighting International Division. The success of this installation has gained C & G Carandini two more such contracts, namely Badajoz, near the Portugese border, and Almeria.

The Mighty Midgets

Special Applications of Miniature Tungsten Halogen Lamps.

A G Buchanan

Mr Buchanan is Product Executive for Miniature and Linear Tungsten Halogen lamps and Automobile and other miniature lamps.

Introduction

In 1963 Thorn Lighting announced the first of a new product range of miniature tungsten halogen lamps. Starting with the 12V 100W M28 the ratings have now extended upwards to the 24V 250W M36 and stretching the limit of halogen technology, down to the 6V 10W M29. The application of the sources have been equally widespread from film "editors" to traffic lights, from display lighting to fibre optics.

Thorn Research and Development engineers were and still are coming forward with new light sources and their achievements were recognised by the Queen's Award for Technological Innovation in 1972 for, among other things, the development of the patented halogen compound

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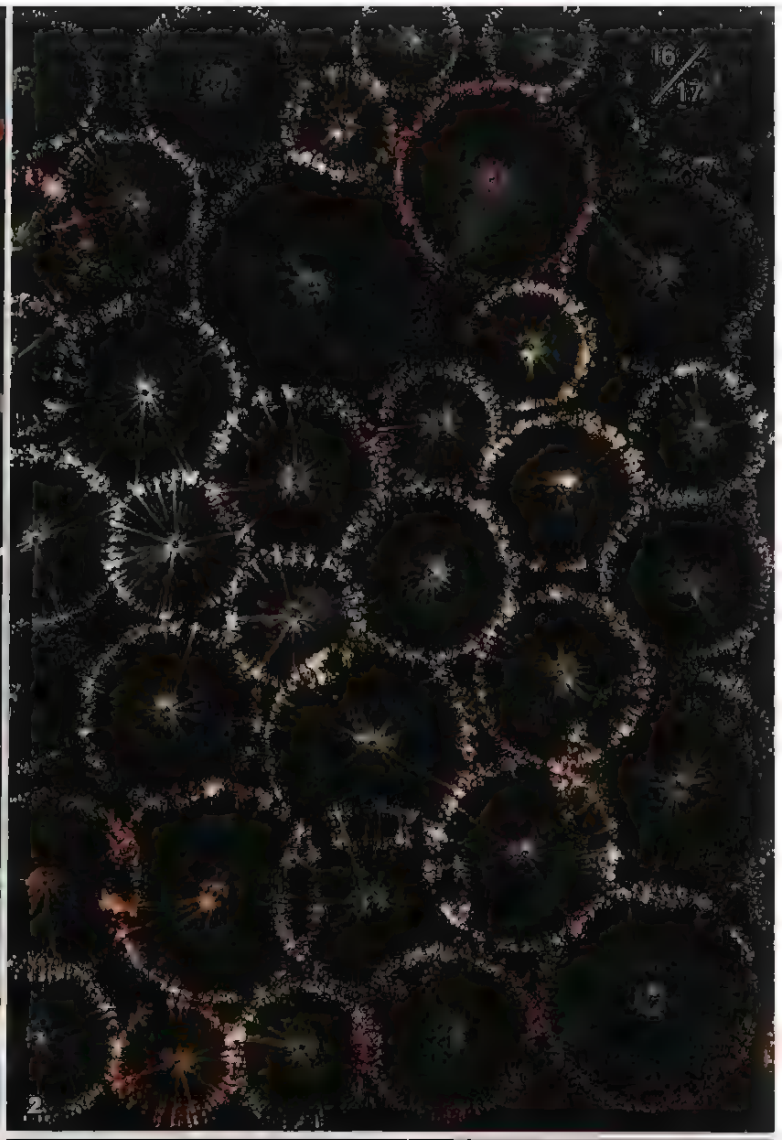

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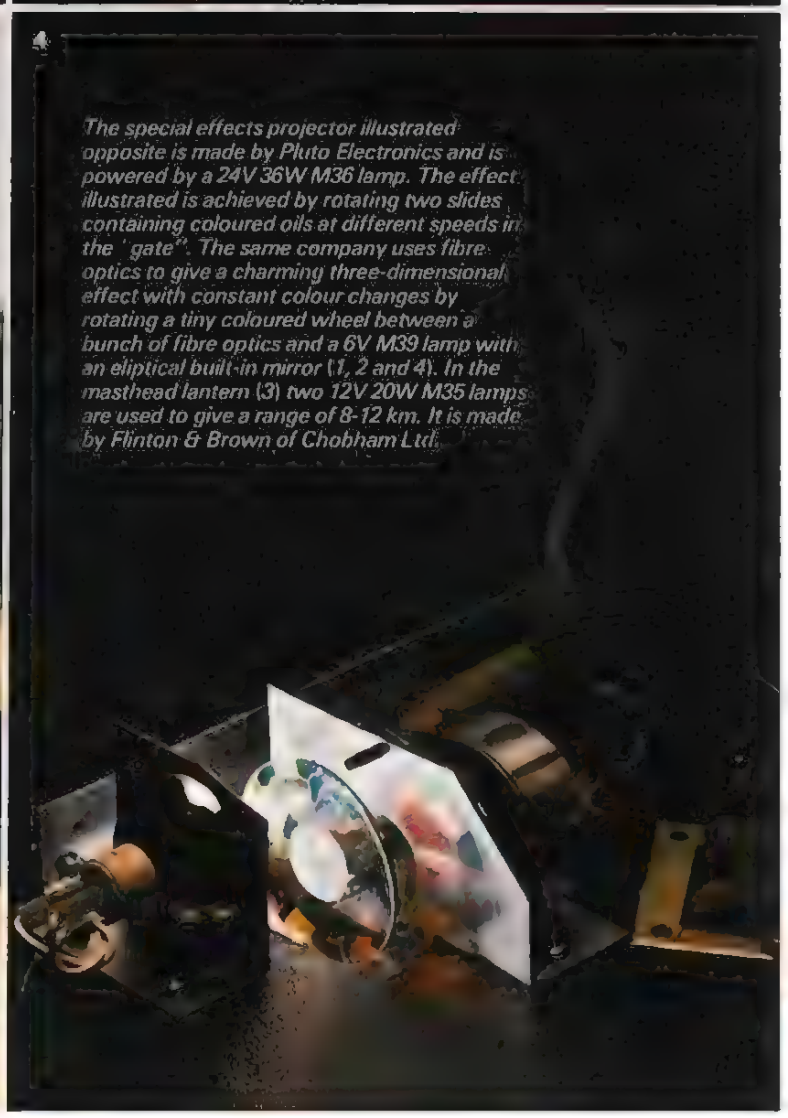

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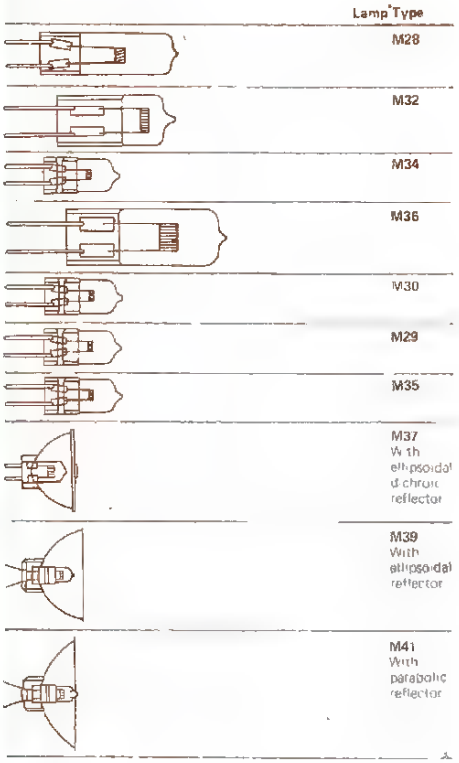
The special effects projector illustrated opposite is made by Pluto Electronics and is powered by a 24V 36W M36 lamp. The effect illustrated is achieved by rotating two slides containing coloured oils at different speeds in the "gate". The same company uses fibre optics to give a charming three-dimensional effect with constant colour changes by rotating a tiny coloured wheel between a bunch of fibre optics and a 6V M39 lamp with an eliptical built-in mirror (1, 2 and 4). In the masthead lantern (3) two 12V 20W M35 lamps are used to give a range of 8-12 km. It is made by Flinton & Brown of Chobham Ltd.

A group of miniature tungsten halogen lamps compared with a 5p piece (22.5 mm diameter). They may be identified in the diagram beside the picture.



'Bromophosphonitrile' and the 6V 10W and 6V 20W miniature tungsten halogen lamps. That their innovations have been eagerly sought is evidenced by the fact that Thorn Lighting have made over a million of these lamps in the last five years.

Design Features

Before looking at some special applications let us examine very briefly some of the attributes of the lamps and the design features that contribute to their ready acceptance. The mode of operation and principal advantages of the tungsten halogen cycle — higher efficacy or extended life, with virtually constant lumen output and colour temperature, are now sufficiently well known not to need discussion here. As their name implies, the small size of these miniature halogen lamps offer immediate benefits to the equipment designer by savings in space and usually cost, but there are additional advantages. These lamps are all of single-ended bi-pin construction i.e. both leads are taken through a single pinch which necessitates only one lampholder, a miniature one of course, thus saving some more space. Add the fact that the filament is pre-focused in manufacture to the tips of the pins and we have a very small, accurate combination. The small size allows any optical system to be designed closer to the source, which is itself more compact and of higher luminance than its conventional counterpart. Naturally this size reduction is not without penalty, the lamp-holder has to be of ceramic and with contacts working at high temperatures and in ratings over 100W the lamp pinch usually needs a heatsink to keep it below 350° C. Below 100W the lamps will burn in any position. Clearly these lamps have interesting possibilities.

Some Useful Applications

One of the earliest types of miniature halogen lamp was the 6V 10W M29 which has been used in many models of amateur cine film editors. Specified at 3200 K colour temperature to match the film the M29 offers small source size with a constant high light output of 210 lumens for 100 hours rated life — a remarkable performance from the smallest of these lamps.

A quiet revolution has been taking place at the numerous traffic intersections across the country. One of the first demands of miniature halogen lamps was to see whether their use could improve the daytime visibility of traffic lights, then using the long established mains voltage 60 mm dia 65W vacuum lamp. Thorn Lighting set to work and developed the 12V 50W M32 lamp. There is, as often happens, more to this feat than meets the eye — the lamp must withstand nearly ¼ million switchings, with an inrush current of up to 30 amps, in its onerous 4 month long duty. The design has been the subject of continuous development yielding considerable improvements in service: for instance the pins are now made slightly flexible to withstand rough handling during lamp changes and are also gold plated to prevent arcing in the lampholder thus prolonging its life and minimising service costs. Thorn lamps are made to BS 505: 1971 requirements. So next time you are driving you will recognise those extra bright halogen signals, so clearly visible in sunlight that they have to be automatically dimmed at night.

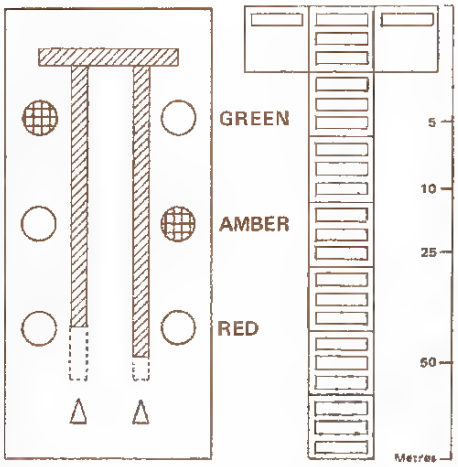
At the top end of the range the 24V 250W M36 packs a 5730 lumen punch and this is used in the special effects projector illustrated on p. 16. This has a conventional optical system but the effects are created by interposing in the beam a wide variety of motor-driven discs or visual effect cassettes which range from continuously moving moiré or geometrical patterns to vivid colour changing liquid effects. The M36 lamp is chosen for its high output, compact source size and long life.

At the low current end, the 12V 20W M35 lamp has enabled the designer of the masthead navigation lamp shown on p 17 to arrive at a precision optical assembly using a power saving lamp. This navigation light comfortably exceeds the exacting new requirements for light output and range of visibility defined in the 1977 IMCO (International Marine Conference) specification for yachts of 12 to 20 metres length. The tricolour unit has a red/green, forward, and white, stern, sector with additional morse warning or anchor lamp facility. The combination of precision source and optics gives a range of between 8 and 12 Kilometres for a mere 20W power consumption.

Mirror Development

Working in parallel with developments in the film projection field, it was not long before Thorn engineers harnessed the output of these miniature light sources, controlling and directing it by

A tanker berthing at the BP Terminal, Hounds Point, Firth of Forth, Scotland. The IDASAT panels can be seen in the centre of the picture.
The smaller diagram shows the state of the panel at an early stage in the berthing of a tanker. The bow of the ship is nearer the jetty than the stern, but the amber lamp is flashing, indicating that the stern is coming into line. The other shows how the logarithmic scale gives a clearer indication of distance as the gap between ship and jetty closes.
Photograph by courtesy of Jones and Healy (Marine) Ltd.



embodying the lamp in a mirror to form an 'integral mirror' lamp. The compact filament and lamp is ideal for a mirror of short focal length which can also have a high proportion of useful surface for its diameter because of minimal cap or bulb obscuration in the centre. The halogen lamp is accurately focussed in its mirror on the production line to give highly consistent performance.

Fibre Optic Applications

The 6V 20W M39 and 12V 55W M37 become the obvious choice for powering fibre optics — an increasingly useful technique which allows the designer considerable flexibility in positioning his lighting points remote from the source. There can of course be multiple outputs from a single powerful source and it is this facility that has made the technique popular for alpha-numeric arrays. The most readily observed examples are among the information signs over motorway lanes indicating speed limit or lane change instructions. In each unit of this type the many illuminated discs forming a particular symbol are lit by light carried by fibre optics from a single source with a back-up lamp. To display a different symbol another lamp fibre optic system is activated.

The fibre optics principle is also admirably demonstrated by the clever use of the 6V 20W M39 lamp and fibres to produce the brilliant decorative effect in the panel illustrated on page 17. This integral mirror lamp is ellipsoidal with the filament at the first focus and the light is collected and focused on to the end of the fibre bundle which is positioned at the second focus. The accurate placing of the lamp within the mirror ensures consistency of performance, essential to maintain the full effect when it has to be replaced.

Dichroic Mirrors

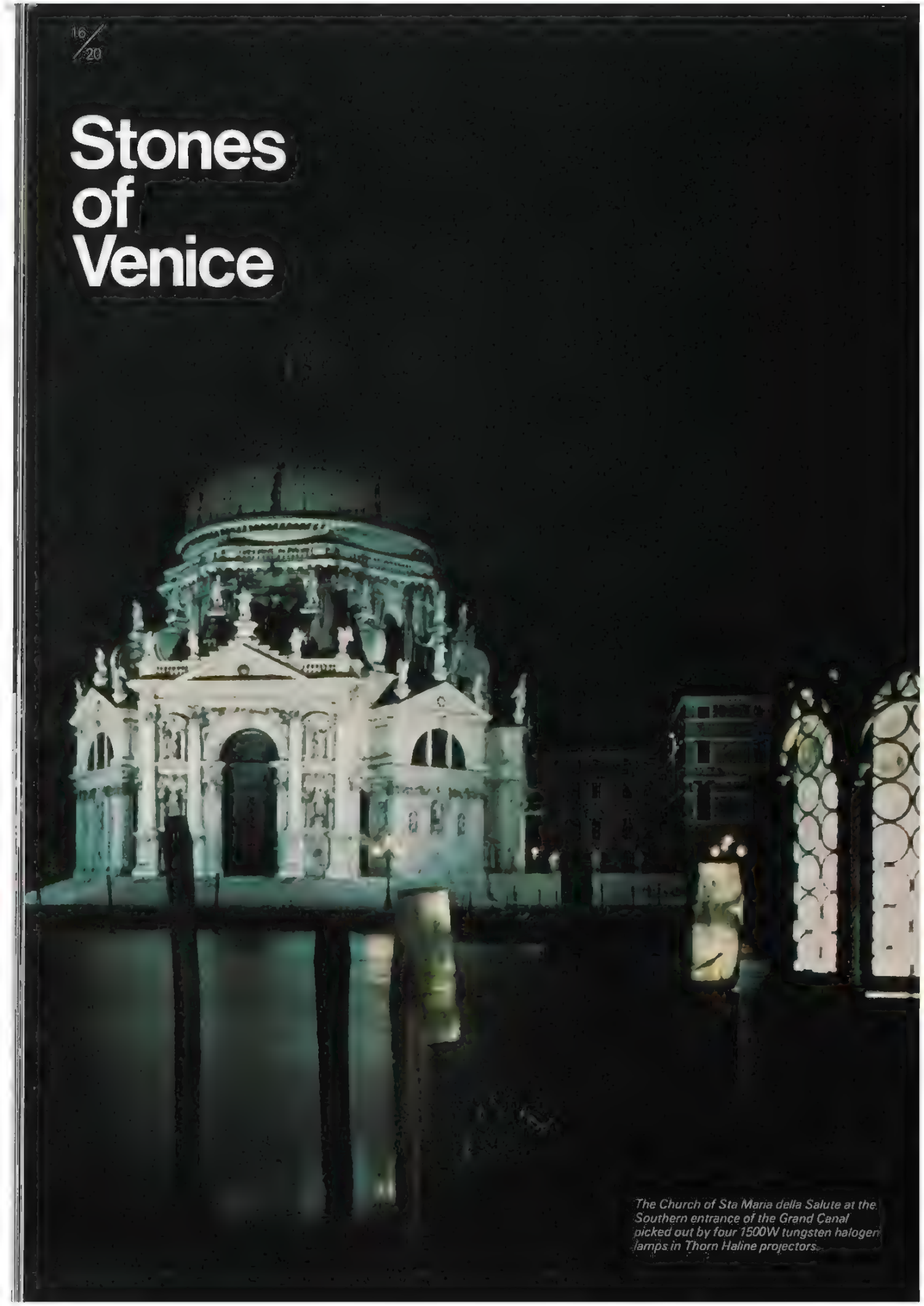
As well as concentrating light, the mirrors reflect the radiant heat emitted by the filament and in some circumstances too much could melt the end faces of the fibres. So for higher powers than 20W we need a "cool" dichroic mirror which reflects the light but allows a high proportion of the radiant heat to pass through thus effecting a cooler beam. The 55W M37 uses this type of mirror.

This lamp was chosen for what must be one of the most interesting fibre optics signalling systems yet developed. Because a mistake in the berthing of an oil or ore-carrying supertanker could cause very considerable damage to the terminal jetty, due to the tanker's enormous tonnage and momentum, approach velocities of less than 8cm/second are common. These slow speeds and the large distances involved (both length of ship and ship to shore) make visual estimates of speed and distance by the berthing pilot himself virtually impossible. A shore-mounted ultra-sonic system which measures bow and stern "distance off" and computes approach velocities and tilt angles is used, but this information must be transmitted to the pilot immediately and without the possibility of misinterpretation. This has led to the development by Jones and Healy of the "IDASAT" integrated visual display. In this, two columns made up of a series of lighted rectangles shows the "distance off" from the jetty of both bow and stern. Approach velocities are indicated in traffic light fashion: green for safe approach, flashing amber for marginally excessive velocity and flashing red for dangerous velocity requiring immediate corrective action. The display has to be visible up to 400 m away in bright sunlight without false images and fibre optic matrices against matt black were found to be the only suitable medium. Because this apparatus is often used at oil terminals, the M37 lamp is carefully positioned in an explosion-proof casting, the high quality fibres carrying the light from a glass window in the housing to the appropriate point on the 20ft wide display.

This unique integration of computed measurement and visual display has been so successful that berthing can be completed in approximately half an hour where previously it took very much longer. There are now installations in the major oil producing and processing terminal ports around the world.

We have looked briefly at a number of uses of miniature tungsten halogen lamps. There will be many more applications for these lamps — indeed there are some in the course of development that cannot yet be disclosed. Thorn design engineers are still looking to extend the frontiers of tungsten halogen technology, and the advanced design attributes of these lamps are perhaps only matched by the ingenuity of the engineers who have achieved the special applications described above, and others yet to come.

Stones of Venice



The Church of Sta Maria della Salute at the Southern entrance of the Grand Canal picked out by four 1500W tungsten halogen lamps in Thorn Haline projectors.

In addition to supplying standard commercial and industrial lighting equipment to a number of offices and factories, Thorn's Italian Lighting Company, the Societa Industriale Vicentina Illuminazione SpA is rapidly acquiring a reputation for specialist floodlighting. .

The Doge's Palace, the Rialto Bridge and the Church of the Salute in Venice have all been lighted by means of 1500W tungsten halogen lamps in Haline floodlight projectors, and the same type of luminaire, housing 500W tungsten halogen lamps was used to light pictures in the Church of SS Giovanni e Paolo, described in the last issue of Lighting Journal.

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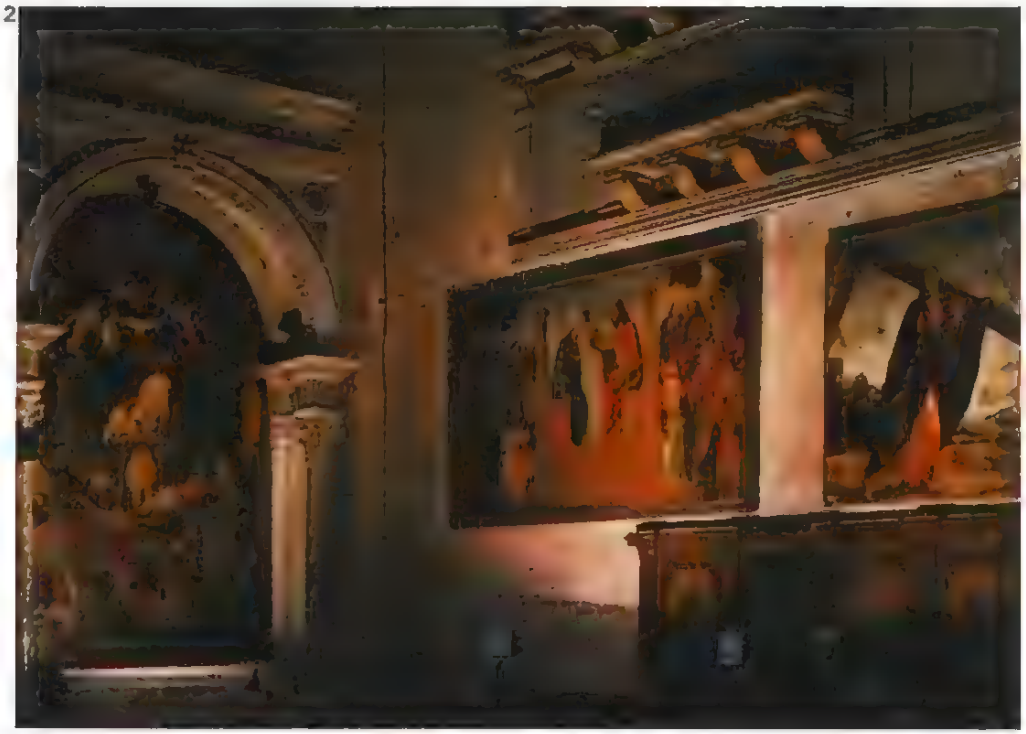


1 *The West front of the Doge's Palace, facing the Piazetta, is lighted by five 1500W tungsten halogen lamps in Haline projectors mounted on the roof of the Bibliotheca opposite.*

2 *Three paintings in SS. Giovanni e Paolo, the Vivarini Christ, a Coronation of the Virgin by Cime da Conegliano and the altarpiece, the Death of St. Anthony by Lorenzo Lotto, are each lighted by a 500W Haline projector.*

3 *The famous Rialto Bridge floodlighted by two Thorn Haline projectors containing 1500W tungsten halogen lamps mounted on the opposite banks of the Grand Canal.*

In contrast to the architectural installations seen on this page, the use of CSI lamps to light football stadia continues to increase as demonstrated in the "fish eye view" of the stadium at Rufina lighted by 60 CSI lamps mounted on four towers to an average illuminance of 260 lux.

3

As can be seen on the opposite page, the 1050 mm 40W tube was introduced to fit present-day modular ceiling apertures but it has the added advantage of a reduced diameter, so that it can be used in slender luminaires. A Thorn Arrowslim batten, taking a 25 mm tube is compared with the 'Pop Pack' housing a 38 mm diameter tube.

The 12m Tube

G V McNeill

Mr McNeill is Product Executive for Fluorescent Lamps and Luminaires.

When the original 40W tubular fluorescent lamp was developed in America some forty years ago its overall length was 4ft (1219 mm) measured from back to back of the slim "tombstone" type bi-pin lamp-holders.

This lamp just allowed for continuous mounting on 48" spacings, but it is too long for the new international metric modular ceiling dimension of 1200 mm, as it overlaps the grid lines of a modular ceiling and cannot be fitted into a recessed luminaire or ceiling enclosure.

A shorter tube was therefore necessary and although some countries in the International Standards Committee for Tubular Fluorescent Lamps favoured a 1165 mm tube, the majority wanted it shorter, to allow for the space taken up in the modular ceiling by walls and partitions, above and below ceiling level, as well as trunking, pipe-work, air-handling and other mechanical or electrical services above it.

So, starting at the 1200 mm construction grid line, 100 mm was first deducted for this "service" space, and then a further 33 mm to cover lamp-holder support brackets, end panels, trims, etc. at the ends of the luminaires or lamp enclosures. This left an overall length of 1067 mm between the backs of the lamp-holders and a consequent length of 1047 mm from face to face of the tube.

This 1047 mm tube, already widely accepted in the EEC, has now been submitted for incorporation in the international (IEC 81) fluorescent tube specification.

The nominal length of the new tube is 1050 mm. It is exactly 152 mm (6 inches) shorter than the standard 40W tube of nominal 1200 mm length. This made the choice of glass tube diameters of 38 mm (T12) and 25 mm (T8) possible and the alternatives were carefully considered. The table below shows standard performance of the 1050 mm tubes of both diameters compared with the standard 1200 mm 40W tube.

The first design was based on the normal 38 mm T12 glass diameter and it was found necessary to increase the tube loading by 2.5W to produce the same light output as 40W tube. This in turn, increased the losses of slim choke gear to 14W and gave a total circuit consumption of 56 watts. A larger choke was also required increasing the capital cost of the system.

The design based on the slim 25 mm T8 glass diameter resulted in the same lumen output as a standard 40W tube with a slightly reduced tube loading of 39W. A standard 40W choke could be used because the very small reduction in tube current was not enough to affect cathode heating and subsequent tube life, whilst the increase of about 3% in lamp voltage had a negligible effect on lamp stability and starting. The T8 slim 1050 mm tube incorporates "low resistance" 3.5V cathodes and is suitable for use with 40W switch start or semi-resonant start gear circuits.

Thorn's choice therefore was the 25 mm slim T8 design, because it avoids the need for special control gear without loss of circuit and lamp efficiency. In addition its slimmer glass tube has improved its proportions and it has been used in the Thorn Arrowslim range, which includes "L" and "U" shaped opal diffuser attachments.

The basic advantages of the new 1050 mm slim 40W tube are:

(a) Its 1047 mm face-to-face length makes it suitable for the most popular 1100 to 1200 mm metric module spaces.
(b) It is suitable for use with all switchstart and S.R.S. control gear.
(c) It combines T8 slimness with a 152 mm (6") reduction in length.
(d) It has the same lumen output as a normal 40 W tube.

Many years have been spent in

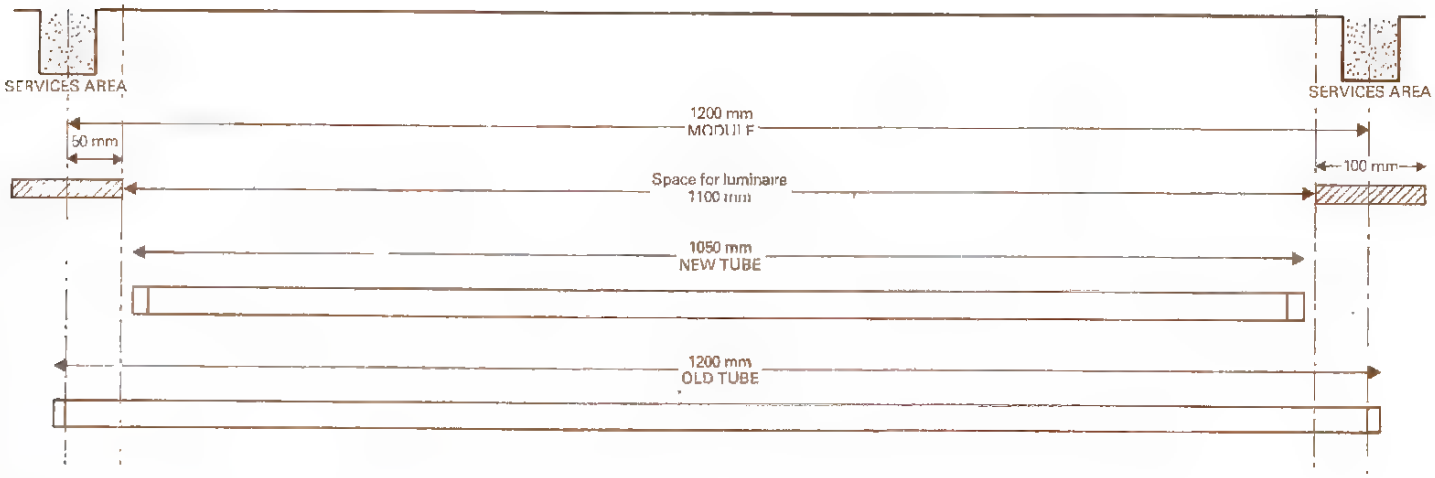
Nominal tube length	1200 mm	1050 mm	1050 mm
Nominal glass diameter	38 mm	38 mm	25 mm
Nominal tube wattage	40 W	42 W	40 W
Actual tube Amps	0.43	0.54	0.425
Actual tube Volts	103	89	106
Actual tube Watts	39.5	42.0	39.0
Slim gear Watts loss	10.5	14.0	10.5
240V circuit Watts	50.0	56.0	49 5
"White" tube lumens	3000	3000	3000
Lumens per circuit Watt	60.0	53.5	61.0

developing and testing the new tube and circuit and ensuring that it fully complies with lighting, electrical and thermal tests for performance and safety. The T8 slim 40 Watt 1050 mm bi pin fluorescent tube is here to stay.

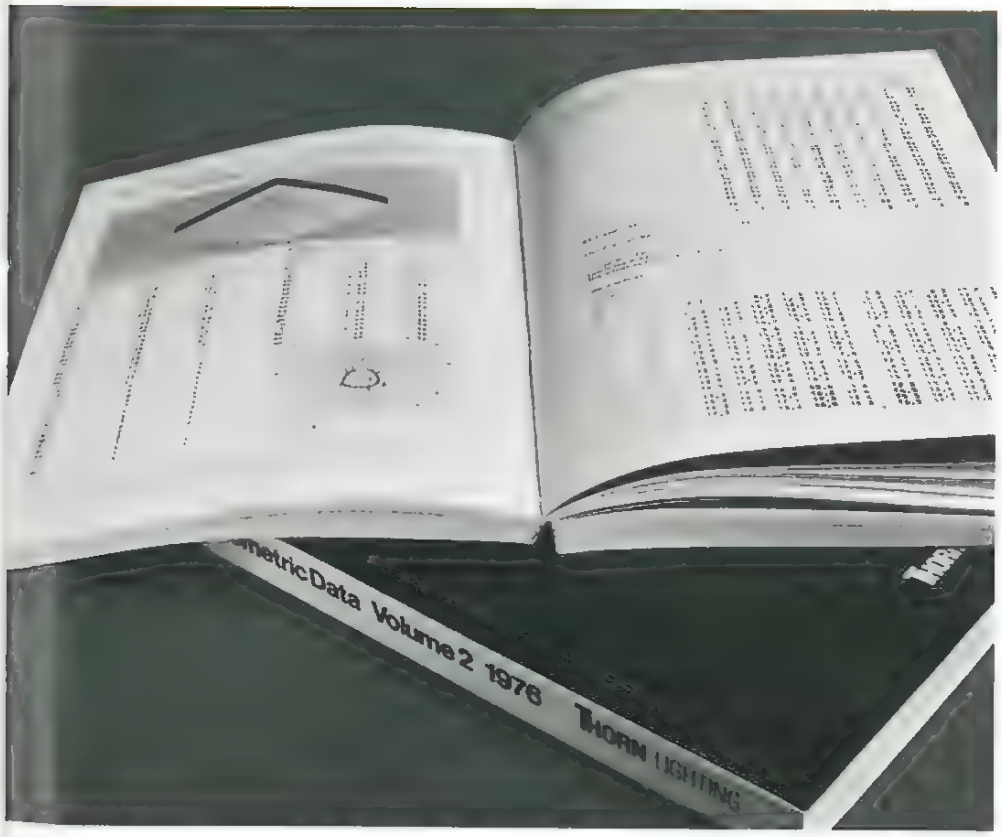
It is of interest to note that this THORN tube completes the only range that covers new metric building needs as follows:

1800 mm 75/85W tube —
for long (1800 mm) modules
1050 mm 40W tube —
for medium (1100 or 1200 mm)
525 mm 40W "U" tube —
for short (550 or 600 mm).

The third tube is in fact the new T8 slim 1050 mm tube bent into a 525 mm x 120 mm nominal "U" shaped lamp (see pages 7 and 8 of the Lighting Journal No 14). Thus a matching pair of linear or compact 40W light sources is available in White, Warm White and Plus White (good colour high efficacy) tube colours. Thorn have given the construction industry the metric modular lighting tools that they asked for, to meet their metrication changeover programme which is now nearing completion. They will be used more and more in the future as architects and interior designers find that they fit the bill.



The Thorn Photometric Data Books



The publication of the second volume of the Thorn Photometric Data Book completes a programme of work begun nearly two years ago. Volume 1 contains photometric data for the whole range of Thorn fluorescent luminaires, except for Clipper and Sheerlume which appear in Volume 2. It also gives data for the Hipak range of industrial fittings using high-pressure discharge lamps. In Volume 2 can be found the data on all Thorn Floodlight projectors including isocandela diagrams for use when calculating area floodlighting as described in the Thorn Outdoor Lighting Handbook. Data for commercial filament and discharge lamp luminaires and for the entire Thorn range of interior display spotlights is also included. Here we believe we are breaking new ground, by providing information which has often been hard to get. Display lighting is usually thought of as more of an art than a science, but there are occasions, as for example, where considerations of conservation impose strict limits on the levels of illumination in museums, where the lighting engineer must calculate illuminance precisely.

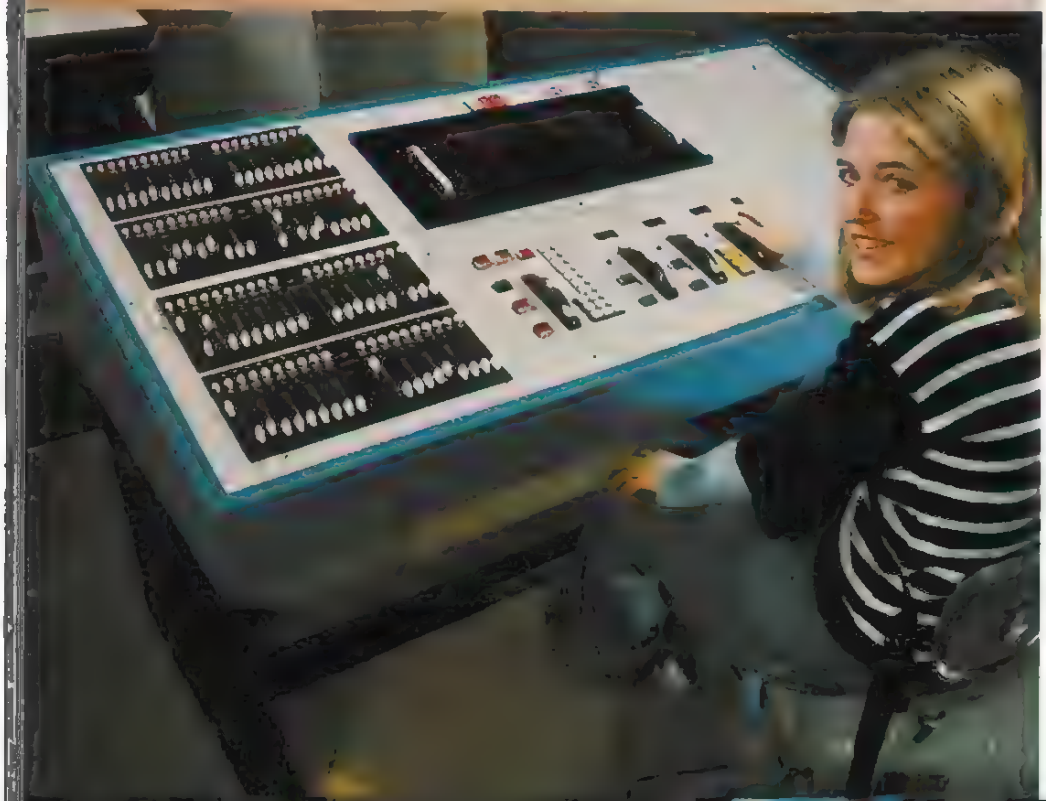
A Q-master 2000 was used to control the lighting of an opera, ballet and musical festival at the Paris Louvre this summer. The control panel used is shown below the well known facade of the Palace.
At the foot of the page can be seen Q-master in use in a colour television studio, and a Q-file installation in the Grand Theatre at Leeds.

How the latest Thorn Lighting control systems make use of a compact "memory" device

The Floppy Disk and Q-Master

E A Stanley

Mr Stanley is a Projects Engineer in the Electrical and Electronic Engineering Laboratory.



In the lighting of stage or television productions, a succession of scenes is illuminated with high power (up to 10kW) lamps or luminaires. A scene is lit by a selection of the luminaires available, each at a pre-selected level of intensity, controlled by a thyristor dimmer.

The information required to produce these intensity levels for each scene is known as a lighting 'cue' and a production may require anything up to two hundred cues to effect the lighting changes throughout the show. The two fundamental requirements of a stage lighting control system are thus, 'Playback' controls, which enable the levels of the required individual lamp circuits to be set up and modified, with the data for this held in a 'playback' store, and a larger 'back up' store known as main memory, holding all the cues for the show.

The First Electronic Control System

It is just ten years since the Thorn Q File heralded the introduction of digital techniques into this form of production lighting control. Lighting designers, while understandably apprehensive of the jargon, nevertheless eagerly grasped the operational advantages of the new approach which made it possible to store lighting cues in a "electronic memory" file, bringing them into use as required and fading one out automatically as the other was brought in, (a device known as a cross fade) and substantially reducing the size of the control panel. This overcame the understandable suspicion of unfamiliar computer technology.

Originally designed for large T.V. studios, Q file has since been adapted to suit the rather different emphasis in the theatre, and today is held in high esteem throughout the world.

An Alternative Approach

In the early 1970's a new system, different in concept, was introduced, known as Q Master (Q Level in the USA). The operation of the panel centred on the traditional principle of circuit control, that of a fader lever per dimmer, with a conventional master fader exercising proportional control over the complete cue.

Thus, a lighting operator, familiar with the so called manual systems was able immediately to associate himself with the prime function of the system, since each luminaire was apparently controlled by its corresponding fader (dimmer) lever. The electronic system associated with each lamp circuit was mounted behind its fader on a small printed circuit card. This mechanical design approach resulted in a reduction of size of the dimmer level intensity memory control system to that of a desk, with the obvious benefits of rapid installation and reduced space requirements in the control room.

How Q-Master Works

The operation of the master control differed in some major respects from that of Q file. A cue having been composed in an orthodox way using the fader panel, lighting level data could be recorded in main memory in any one of the hundred 'memories'. Once "in memory" it could be recalled as a lighting change to any one of three identical playbacks, A, B, or C, each under the proportional control of a master fader.

The playback master faders A, B, C, thus had traditional control functions. For example they permitted manual fade changes. That is, effectively, fading from one cue to the next occurred rather than an instant change.

Furthermore, they facilitated the balancing of groups of luminaires for "colour-balancing" or group mastering. With this technique, a group of lamp circuits, for example illuminating part of a scene, or providing a particular colour, is varied proportionately to the other groups, whilst retaining the individual balance of one level to another within the group.

The 'C' master had a further function. It could be used as described above but in addition provided an automatic "timed cross-fade" with the required fade-time set up on an associated C "time-fader". Pressing a C memory recall button thus enabled, for example, an automatic cross-fade to occur, freeing the operator to set up special effects against an automatic background fade.

Problems of Memory Storage

In main memory, the cues, once composed during rehearsal, must be retained for the "run" of the show. Thus the data must be remembered even if the control system is switched off. Such stores are known as "non-volatile" and Q-master used the magnetic core-store for this purpose. The decisive factor in the choice was the lack of an acceptable alternative, its chief disadvantages being cost and lack of versatility. In the play-backs, the cheaper, smaller semi-conductor Random Access Storage (known as RAMS) could be used, volatility being relatively unimportant.

Market response to Q-master was extremely gratifying, and customer feedback has resulted in the addition of various improvements and options. Improvements such as increasing the number of Memories/Lamp circuits and 'repertory storage' proved more difficult to accommodate. Repertory storage is used where several shows, each with its set of cues, may be running in parallel in a theatre. This facility allows the cues for a particular show, once composed and memorised during rehearsal, to be copied electronically in order to free the main memory for another show. The copy is then re-entered into main memory when required.

Apart from the cost aspect, the core stores system requires custom-built assemblies which together with the associated drive electronics, eat into the printed circuit card space available. At the time it was first specified for Q-file its reliability, now shown to be acceptable, was the subject of long debate and trials. However the so called 'rotating memory' of the day 'the magnetic drum' was undoubtedly inferior to it in terms of mechanical complexity and access time, to say nothing of drive requirements. Subsequently, in the development of a repertory facility for Q file, another contender, the magnetic tape casette had been studied. With this storage medium, cues are recorded, one after another, sequentially along the length of a special version of the familiar audio casette. In a main memory application, for example, it may be necessary to put onto the stage first cue 50, next cue 5 and then cue 95. This is known as random access. With the casette the tape would have to be run back and forth, which increases access time. Whilst so called 'high speed search' techniques reduce this limitation, they in themselves produce other problems.

Fortunately advancing technology suggested a solution to the requirement by the development of Large Scale Integrated logic (LSI) bigger, cheaper, RAMS and, the crucial factor, a promising alternative to the core store. This was the disc drive but although disc stores had been commonplace for over a decade, they had a number of disadvantages. The flexible disc drive, now known universally as the "floppy", solved most of these problems.

Operation of the 'Floppy Disc'

The floppy disc drive, in addition to overcoming all these disadvantages, appealed because of its simplicity. The storage medium is a flexible disc coated with magnetic material. Data is stored on one of a number of tracks, access to any one of which may be made at random. The diagram shows a schematic of the machine, in which a stepper motor-driven lead screw moves the recording/replay head radially across the disc in incremental steps, while the latter is rotating at a fixed rate. For recording or replaying, a solenoid driven head actuator allows the head to contact the disc.

Its operation is analogous to the familiar record players action, except that the 'pick up' (record/replay head assembly) is driven radially by the stepper motor is ***discrete*** steps (one

per track) and the 'stylus' (record/replay head) is allowed to contact the disc surface for one revolution or so, not just to replay but also to record onto the selected track.

Originally developed by IBM in the late 'sixties, the floppy disc system was used by them for several years, before being publically launched in 1973 as an integral part of a commercial equipment. Such was its potential that within a year many other manufacturers marketed their version of the device.

A very thorough investigation was carried out by the Thorn technical team, who consulted both manufacturers and users from the computer world, and finally selected a machine type which was then subjected to rigorous laboratory trials. It lived up to its initial promise and once reliability was confirmed, its advantages over "core" could be exploited.

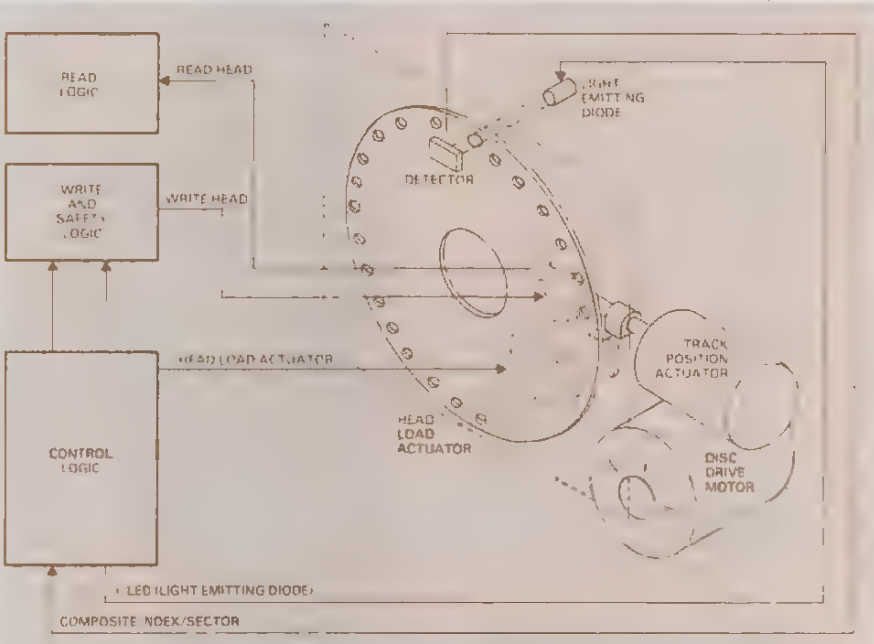
The cost per unit was such that two drives could be incorporated, thereby permitting hitherto unobtainable features as rapid copying for repertory and rearrangement (editing) of "cues". Furthermore, the storage capacity enabled up to three hundred "memories", each up to 200 circuits, to be stored in each disc, giving an immediate system potential of 600 memories, infinitely expandable by changing disc, in itself a very simple operation.

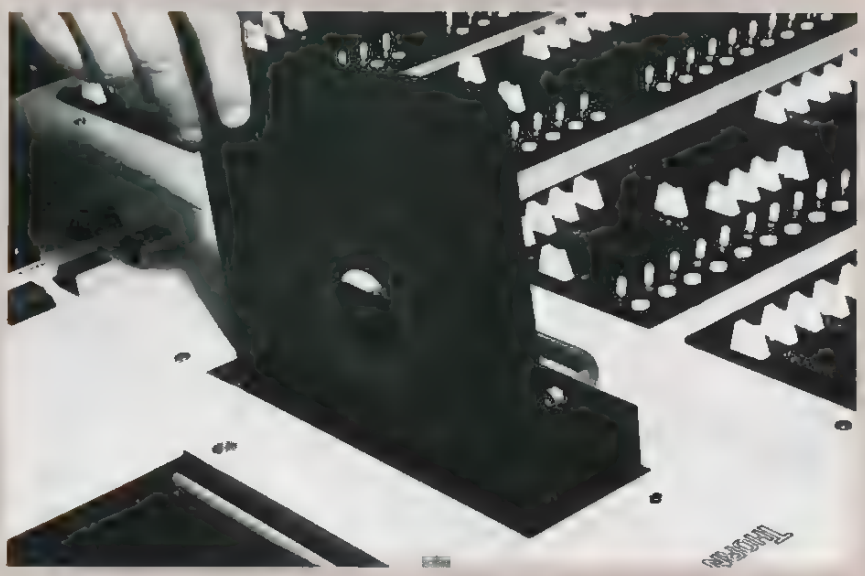
Q-Master 2000

This latest addition to the range of Thorn electronic control systems, is called Q-Master 2000. Its operation is based on that of the previous Q-Master and its salient features, in addition to those associated with the inclusion of the flexible disc drive are:

1) A manual fader/lighting circuit with direct control of any number of lamp circuits at any time if required.
2) Ability to memorise "from the stage" or to "plot blind".
3) Mixing of manual and automatic fades.
4) Playback flash facilities.
5) Use as a conventional manual system (three-scene preset) independent of its "memories" thus permitting supplementary on stage performance without disturbing "memories" for the main production.
6) Remote Control Facilities.

The first system was installed in London at the famous Mermaid Theatre. Following successful exhibitions, systems have been installed in many other parts of the world. Thus innovation, knowledge of current technology and the use of constructive customer criticism continues to produce equipment to serve the expanding requirements of stage and television lighting control.





The disc is housed in the unit shown centre; it can easily be slipped into place as shown above. The diagram explains the mechanism. The disc rotates continuously in its protective envelope, light shining through the perforations being used to locate the correct sector. The track position actuator moves the head assembly across the disc, and the stylus is brought into contact with it to record (write) or replay (read) the sector as dictated by the control logic.

Lamps for Photo-chemical Applications

P T Anstee and G J Beeson

A free-standing exposure unit, some 4' 0" high, for a printing frame embodying a Graph-X lamp. A remote control unit can be seen on the right and a timer on the left of the picture. Photograph by courtesy of Duval Graphic Services Ltd.

Mr Anstee is Product Executive for Photo and Reprographic Lamps.
Mr Beeson is manager of Special Lamp Applications at Thorn Lighting Leicester.

A number of special lamps are produced by Thorn Lighting for photochemical applications.

The subject of photochemistry and photo-polymerisation is complex and extensive and it is not proposed to elaborate it but to examine some of the sources of radiation and the application of these to some of the processes used in industry.

Photographic and printing industries and associated activities, such as print drying, paint, varnish and resin curing can all benefit from the research being undertaken at present on these more efficient sources for photochemical applications.

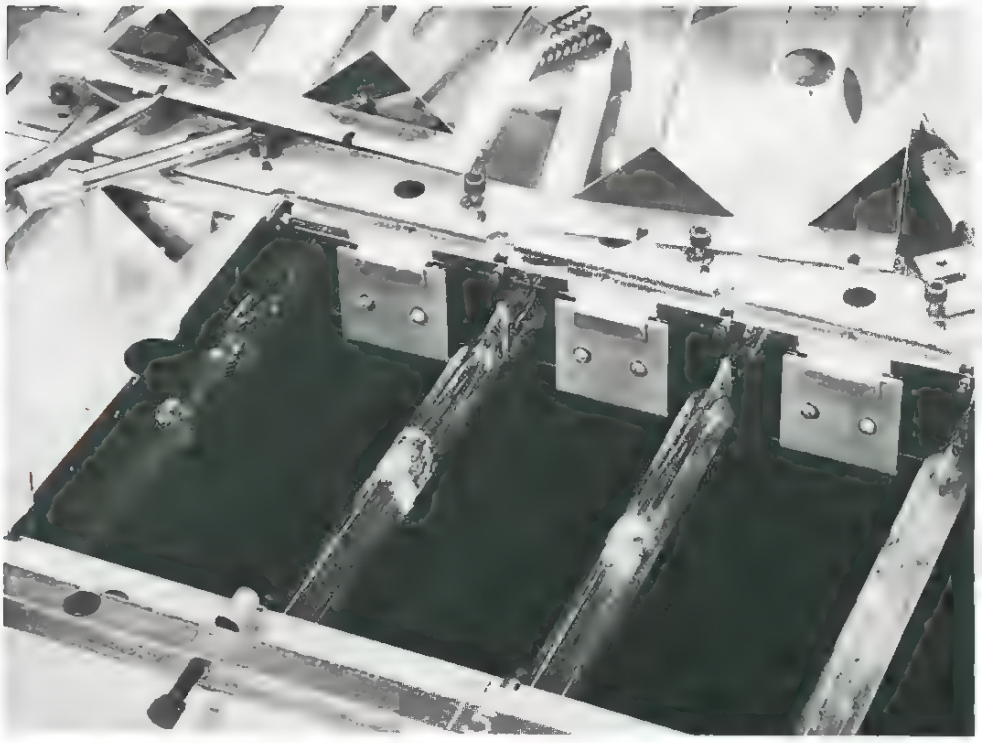
Spectral Requirements for Colour Photography

Although long and near U.V. is passed by glass, U.V. radiation is not essential for colour reproduction and is usually absorbed by the colour filters used in making colour separation negatives, but it is essential that there is no large deficiency in any part of the visual spectrum. Because of this condition, lamps with line spectra are only suitable for monochrome work.

The colour of the light of the various sources may range from an approximation to daylight to that of high intensity tungsten filament incandescent lamps. The light output must be high enough to allow reasonably short exposure times, which in practice means higher intensities for colour work than for monochrome; the distribution must be such as to provide uniform illumination of the original and a relatively low operating temperature is required to avoid damage to the original by heat, while the lamp efficacy in the energy band matching the sensitivity of the photochemical system should be as high as possible.

Types of Lamp

For many years the carbon arc was the preferred source, the light output characteristics of a well adjusted carbon arc lighting unit meeting the requirements very well. But it has many disadvantages, not the least of which are the harmful effects of U.V. radiation. Smaller size colour copying is very conveniently handled by filament lamps. The introduction of tungsten halogen sources has practically ousted the conventional photoflood from the industry. The halogen lamp's advantages of constant colour temperature, constant light output throughout life and the simplicity of control have made it very popular for copy-board work.



Part of an U.V. ink-curing luminaire opened up to show the array of linear metal halide lamps. This fits on to the mouth of a printing press. Photograph by courtesy of Beasley-French and Co Ltd.

The intensity of mercury vapour lamps of the low pressure types is low and exposure times consequently long, but the long lamps give fairly even illumination and they are much used for copying large originals such as maps and charts. High pressure mercury lamps are only used for monochrome work and have essentially line spectra, but with a higher luminosity; they suffer from the long 'run up' time and the period which must elapse before they can be started after switch off.

In 1958 the introduction of pulsed xenon lamps made available a light source which was free to a large extent from the disadvantages of the carbon arc and the mercury lamp. The arc is struck in a xenon-filled quartz envelope, the pulsing giving a higher efficacy with a continuous spectrum in the visible region. It is very suitable for colour work, producing light of high actinic value rich in U.V. and blue.

A near relative of the pulsed xenon lamp, the electronic flash tube is a compact source of very high intensity, primarily used in taking photographs and for pre-flashing to increase the response speed of sensitised coatings.

The development in recent years of mercury lamps with metal halide additives to modify the spectral distribution has led to light sources which have advantages over even pulsed xenon lamps, such as less complicated and less costly control gear, a considerable saving in lamp cost and the ability to select additives which will boost the U.V. radiation in a closely selected wave band width, and provide a method of reducing exposure time. Typical examples are lamps of the Graph-X type in a sealed beam form, giving some 11% of the input power in the 320-450 nm band, and peaking at 365 nm or at 420 nm. This lamp is basically a mercury lamp with the metal halide additive of gallium. It is small and compact, the quartz discharge tube being enclosed within a hard glass sealed beam reflector bulb which provides a very efficient and flat field of illumination and completely suppresses any harmful U.V. radiation.

Other short bare-quartz linear lamps are also available, having applications in the printing industry.

It must be emphasised that where bare quartz lamps emitting short and erythemal producing radiation are used, they must be fully enclosed and interlocked to prevent direct viewing. Provision must also be made to prevent any build up of ozone to a toxic level. Lamps are available made in special types of fused silica to suppress ozone producing radiation but in some applications their use may reduce the cure speed.

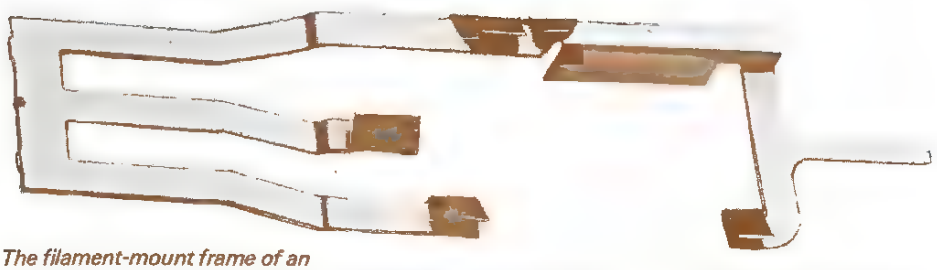
Plate Making Techniques

Printing plate production by the formation of an acid resistant film on metal was first carried out by Niepce in the early 1800's using a natural bitumen sensitive enough to allow an image to be printed. A visible image in relief is achieved as a result of chemical hardening of the colloid film, usually natural shellac or polyvinyl alcohol, coating the metal. A transparent negative is held firmly to its surface and it is exposed to light, as when making a photographic print. The unexposed (white) areas remain soft and can be washed away, leaving the hardened parts 'proud' of the surface so that a print can be made. These dichromatic coatings are highly sensitive to frequencies from about 300 to 450 nm, peaking between 360 and 400 nm. Since printing frame glasses, glass and film based negatives and gelatines all transmit radiation only at wave lengths longer than 320 nm, a light source having emission of 360 to 400 nm is required.

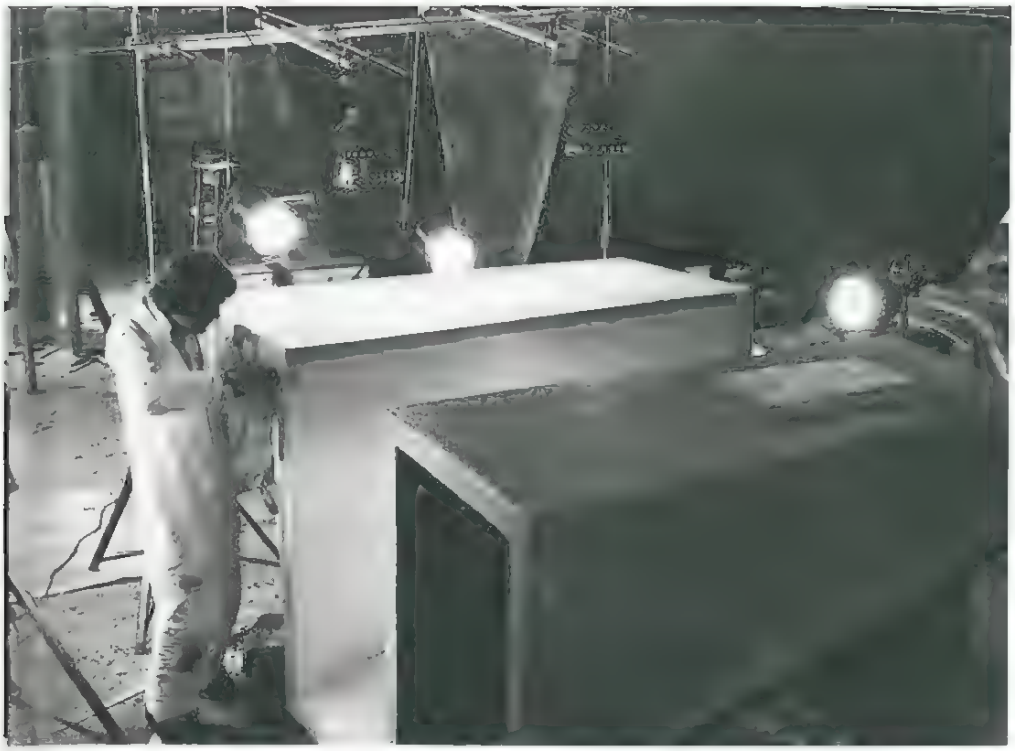
In many modern techniques the process of photopolymerisation is used. Polymerisation is a chemical process of linking small molecules, called monomers, to form large complex molecules, called polymers. Monomers are often quite fluid liquids which are turned into thick viscous liquids or solids when polymerised. These chemical processes are usually quite slow, but some monomers can be polymerised much more rapidly by exposure to U.V. or visible radiation, which is absorbed by the molecules, causing them to link together more readily: this is the process of photopolymerisation. The addition of substances called photoinitiators extends this to a wider range of polymers and further speeds the process, so that thin films can be solidified in milliseconds and thick laminates in a matter of minutes. Today, there are a number of commercially available photopolymers used for the preparation of relief image plates which require a rich source of U.V. radiation during exposure, generally in the longer wave bands between 320 nm and 430 nm.

Where time and cost is important with relatively short printing runs, a thick skin of polymer on a metal plate is exposed through a master negative to radiation from a pulsed Xenon lamp which hardens the polymer and secures this to the base. The plate is then washed out to leave a relief plate which is subsequently further cured to produce a stable material.

Another use is in colour proofing systems, such as the 'Chromalin' process. A tacky photopolymer layer is exposed through a half-tone positive, the exposed areas



The filament-mount frame of an H4 tungsten halogen automobile headlight lamp is produced by an electro-etching technique.



Finishing a fibre-glass construction using Impolex-K resin by curing it in the violet light from Thorn Graph-X lamps. Photograph by courtesy of ICI Ltd.

harden due to polymerisation, but unexposed areas remain tacky on a transparent base and accept the toner. Since these sheets are transparent, by superimposing them a proof is obtained simulating a press proof. Since the light source provides a high U.V. intensity in the wavelength range of 340-380 nm with a minimum of visible emission, mercury type lamps are used.

Ink Drying Techniques

After the copy has been printed the work must be dried. Traditionally the sheets are sprayed with a 'set-off' powder to prevent them sticking together and are then stacked and allowed to dry. This is costly both in time and in the storage area required. Recently inks which contain photoinitiators responsive to U.V. radiation have been developed and metal halide lamps are used to dry these special inks. The lamp arrays are mounted directly on the press, the finished work passing beneath the lamps as it is fed off the machines.

U.V. ink cure systems will ultimately provide an improved flow line system and the elimination of set-off sprays and the time-consuming airing and storage areas of sheets. Since solvents are not used in U.V. inks, there are no problems of atmospheric pollution. In addition, in such an important area as food packaging, there is no danger of the flavour of the contents being affected.

The Beasley-French luminaires embody from 6 to 15 U.V. emitting metal halide lamps per unit and are fitted within the upsweep of a delivery unit attached to a printing press or applied over transfer drums between press units to provide intercuring of coloured inks. The exposure is in milliseconds but the speed of cure is very dependent upon the ink source and the colour of the ink, black inks being more difficult to dry. The printing and curing of inks on general packaging materials is not a very economic proposition, but for high quality packaging and in particular the more difficult areas of printing labels with foil or plastic substrates the high cost of the ink is justified. U.V. curing then becomes much more important. Where in these applications no ink absorption takes place, curing is slower and there are ink adhesion problems, but these are being resolved.

Miscellaneous Applications

In the wood finishing industry the polymers used in "filler" coats are mechanically applied, cured under U.V. and sanded flat within seconds. The boards are then finished with a top coat which may be printed with a U.V. curable ink to simulate a particular wood grain and coated with a U.V. cured hard resin finish. The metal decoration industry also uses U.V. curing of coatings on beverage cans. A white base coating is applied followed by printing with U.V. inks.

Fast solvent-free U.V. curing adhesives are used for bonding glass components like optical lens or glass to metal, when instead of hardening naturally as in a two-part catalyst system the material will not harden until it is actually exposed to U.V. radiation. The same principle is being used by I C I in a new form of resin for glass reinforced plastics that is curable using violet light. The 'Impolex'K resins remain in an uncured state until exposed to this radiation and a green cure stage is reached within about 4-5 minutes, permitting higher utilisation from fewer expensive moulds. A photoinitiator which responds to violet light permits the use of lamps such as the Thorn Graph X which are harmless to personnel during the cure stage.

The 'Germicidal' type lamp, rich in 254 nm radiation, plays an important part in certain cure systems where a "pre-gelling" or "skin cure" controls oxygen inhibition, the subsequent curing in depth being carried out under a higher pressure U.V. source. This 'germicidal' lamp has a particular advantage where extremely heat-sensitive materials are involved. In a fluorescent tube form, a phosphor converts the energy to longer-wave U.V. radiation and they are used in banks for the exposure of photo-resists used in printed circuitry, solder resists, and for electro-machining. The illustration on p. 28 shows an electro-machined mount frame for a tungsten halogen lamp where a photoresist resin coating protects the frame and the unprotected metal was removed by electro etching.

Thorn are to the fore in the production and development of various metal halide lamps of linear types, of compact single ended and sealed-beam designs, each form designed to give optimum results for various applications, and there is every reason to believe that many solvent based processes will be superseded by U.V. cure systems giving an essentially pollution-free process. The carbon arc is being rapidly replaced by a range of mercury and metal halide lamps and there is a trend towards higher lamp powers where plate cure speeds are slower to gain other technical advantages.

A "flip-top" printing frame for plate making that incorporates a Thorn Graph-X lamp. It is made by Parker Equipment Ltd.

Dans cette édition.

ECLAIRAGE DE SECOURS 2
S. A. Doo

Une norme nationale couvrant l'éclairage de secours dans le Royaume-Uni est enfin réalisable grâce à la publication de la norme BS.5266: Code de pratique pour l'éclairage de secours dans les locaux.

Un éclairement minimum de 0,2 lux est stipulé avec un facteur d'uniformité de 0,40:1. Ceci permet d'éclairer, à des niveaux de 20 lux, les points importants tels que les sorties, les escaliers, les bouches d'incendie etc.

Les services de pompiers exigent une garantie par écrit selon laquelle les installations se conforment à des normes minima de sécurité, mais en définitive, c'est au propriétaire ou au locataire qu'il incombe de s'assurer que les normes soient respectées.

Il est recommandé d'adopter des méthodes de planification simples à l'aide de diagrammes isolux, pour assurer que l'éclairement minimum soit toujours maintenu dans le chemin de secours. Les appareils d'éclairage seront alimentés à partir de batteries centrales (systèmes asservis) ou bien seront du type autonome, renfermant leurs propres batteries rechargeables et s'allumant en cas de panne d'électricité dans le circuit qui les alimente. Cette méthode présente les avantages de la simplicité et d'une plus grande sensibilité que les systèmes asservis. Les tests effectués régulièrement représentent une exigence fondamentale de la norme BS.5266.

Dans certains cas, on peut installer des systèmes d'éclairage de secours fournissant suffisamment de lumière pour permettre de poursuivre le travail; mais ceci n'empêche pas la nécessité de prévoir des systèmes d'éclairage de secours dans n'importe quel bâtiment d'accès public.

LA LUMIERE QUI VEILLE SUR NOUS 6
D. Wilkinson et R. C. Aldworth

Un éclairage bien conçu est le seul système de sécurité qui ait également un effet de dissuasion. Non seulement il est difficile aux voleurs de s'approcher sans être détectés, mais aussi les veilleurs peuvent effectuer leur ronde en toute sécurité, et le moral est bon. Le coût annuel des cambriolages pour l'industrie britannique se chiffre à £66 millions environ. Les primes d'assurance sont réduites dans les cas où une bonne sécurité est assurée.

L'éclairage de sécurité ne se limite pas à l'industrie; l'éclairage par projecteurs des bâtiments publics met en relief leur aspect et en augmente la sécurité.

Pour assurer complètement l'effet de dissuasion, l'éclairage doit se faire toute la nuit. Les clôtures doivent être éclairées sur toute leur longueur. Les projecteurs d'éclairage doivent être orientés vers les intrus et ne pas éblouir les veilleurs. Les niveaux d'éclairage dans les salles de garde doivent être réduits, afin que les veilleurs puissent voir à l'extérieur sans être vus; en outre, le matériel d'éclairage et son câblage seront à l'abri de toute ingérence extérieure. Si on utilise des caméras de TV au silicium en circuit fermé, il est recommandé de prévoir, près des caméras, un éclairage supplémentaire au moyen de lampes MBI ou SON. Si des caméras à infrarouge sont utilisées avec leurs propres sources de rayons infrarouges, en plus de l'éclairage général, alors il n'y a pas de restriction quant au choix de source lumineuse.

LE PROGRAMME 2 FAIT DE GRANDS PROGRÈS 9
M. Pinniger et H. John

L'importance de planifier avec soin les étapes initiales des projets du Programme 2 a été justifiée dans la pratique au cours de l'année précédente. Certains développements techniques intéressants ont augmenté l'utilité et la souplesse du système.

La modification des appareils d'éclairage New Format, qui reçoivent à présent des tubes en U de 40W au lieu de deux lampes de 610 mm 20W, a conduit à un éclairage plus puissant tout en réduisant le coût.

Une installation de boîtiers en acier Programme 2 vient d'être terminée, et la barre à air linéaire, unique en son genre, démontre son avantage, permettant de réduire jusqu'à raison de 40% les frais de diffusion d'air.

Une variante du boîtier linéaire utilise des appareils "Clipper" standard, disposés dans un élément standard de 1500 × 1500 mm, avec diffusion d'air.

Le Programme 2 a démontré qu'il peut s'adapter à un module différent: ce sont seulement les boîtiers qui exigent un outillage spécial. Après amélioration du fini de surface, le système peut également être utilisé à semi-découvert. Même la grille de support peut être modifié le cas échéant, et ceci a été fait dans une installation utilisant des boîtiers de 3200 × 1400 mm avec des tubes de 1800 mm 85W à l'intérieur.

ECLAIRAGE DU STADE VICENTE CALDERÓN A MADRID 12
P. W. J. Holley

Le magnifique stade du Club Atletico à Madrid a été sélectionné pour la Coupe du Monde en 1982, et c'est là également que s'est tenu le match entre l'Espagne et l'Allemagne de l'ouest en quart de finale de la Coupe des Nations européennes cette année. Avant que ce match puisse se jouer, il avait fallu modifier l'installation d'éclairage et la mettre au niveau international pour la télévision en couleur. L'agent de Thorn Lighting en Espagne, C. & G. Carandini a obtenu le contrat, et s'est servi des positions existantes des portiques et des projecteurs d'éclairage à l'avant de la toiture de la tribune.

Le contrat a été signé le 10 mars; le lendemain, 320 projecteurs Thorn ON 1600 étaient expédiés à Madrid. Entretemps, le service conseil de la Division internationale Thorn déterminait l'agencement détaillé de l'installation à l'aide de son ordinateur à Leicester. Lorsque furent confirmés les emplacements des projecteurs, l'ancien matériel avait déjà été enlevé et les travaux avaient été entamés sur la nouvelle installation. Celle-ci est conçue pour donner un éclairement de 1600 lux dans un plan normal à la position de la caméra principale de TV, conformément aux normes espagnoles et de l'UEFA pour la télévision couleur. Avec 18% réduction de puissance installée, la nouvelle installation a permis d'accroître de 314% l'éclairement par rapport au matériel remplacé.

L'installation était terminée le 7 avril, 28 jours après réception de la commande, et à temps pour l'éclairage d'un match entre Atletico et une équipe locale le 8 avril. Grâce à ce succès, C. & G. Carandini a obtenu d'autres contrats à Badajoz et Almeira.

LAMPES MINIATURES 16
A. G. Buchannan

Les lampes miniatures au tungstène-halogène ont été annoncées par Thorn pour la première fois en 1963. Depuis lors, la gamme de lampes a été élargie pour convenir à plusieurs applications différentes.

Ces très petites lampes à un seul culot permettent d'économiser de la place d'une part, d'autre part de procéder à la pré-focalisation très précise des systèmes optiques. Leurs dimensions réduites conduisent à un problème de dissipation de chaleur, et il faut donc prévoir des plaques de refroidissement et des douilles de lampe en céramique.

La lampe M29 (6V 10W) a trouvé l'une de ses premières applications dans les feux de signalisation, où sa taille réduite et son rendement élevé ont complètement résolu le problème de mauvaise visibilité par lumière solaire intense. D'autres types de lampes, par exemple la lampe M36 (24V 250W) sont utilisées dans les projecteurs à effets spéciaux; et la lampe M35 (12V 20W) est illustrée dans une lanterne en tête de mât pour yachts.

Les lampes montées dans des systèmes à miroirs sont très souvent utilisées en optique à fibres dans des applications allant des panneaux de signalisation éclairés sur autoroutes aux étalages décoratifs. Des miroirs dichroïques sont utilisés avec les lampes plus puissantes afin d'empêcher la fusion des extrémités des fibres.

Des lampes de ce type sont employées dans le système de signalisation entre rive et navire "IDASAT" afin de faciliter l'accostage des pétroliers géants. Les vitesses d'approche sont indiquées par des signaux clignotants, et les distances à partir du quai sont indiquées par la longueur apparente de barres horizontales éclairées. Les durées d'accostage peuvent être réduites à une demi-heure, et le système est à présent installé dans les principaux terminaux pour pétroliers et minéraliers dans le monde entier.

On peut prévoir, en toute confiance, que d'importants progrès seront réalisés dans l'étude et l'application de ces lampes.

NOUVEAU TUBE FLUORESCENT MINCE DE 1050 mm DE LONG ET DE 40 W 22
G. V. McNeill

Le tube fluorescent standard de 40W, de 1219 mm de long, introduit il y a quelque 40 ans, est trop long pour s'adapter à un plafond modulaire de 1200 mm; le Comité des Normes International (IE681) envisage actuellement, pour les lampes fluorescentes tubulaires, un tube plus court d'une même puissance.

Bien que certains pays membres soient en faveur d'un tube de 1165 mm, la plupart d'entre eux préfèrent un tube plus court afin de tenir compte des obstructions dans l'espace modulaire.

Le Comité a abouti à un tube d'une longueur de 1047 mm entre faces, en commençant par déduire 133 mm de l'espace modulair de 1200 mm puis en ajoutant 10 mm pour l'épaisseur des douilles de lampe.

Si on compare une lampe nominale de 1050 mm 40W, fabriquée en tube de verre de 38 mm (T12) ou 25 mm (T8) de diamètre de manière à produire le même flux lumineux que le tube existant de 1200 mm 40W, on constate que le tube de diamètre inférieur est plus efficace et qu'il peut fonctionner à partir d'un ballast standard de 40W.

La gamme Thorn de tubes fluorescents de cotes métriques comprend, outre ce tube, le tube en U de 40W (un tube T8 de 1050 mm replié en forme de "U") ainsi que le tube de 1800 mm 75/85W.

LE DISQUE SOUPLE 24
E. A. Stanley

Les représentations de pièces de théâtre et les mises en scène dans les studios de télévision exigent des systèmes de réglage de plus en plus perfectionnés pour produire les variations de lumière complexes ou bien les "repères" nécessaires. Cet article décrit certains aspects de l'étude et la mise au point de ces systèmes, ainsi qu'l'évolution du Q-master à partir du Q-file, premier type de réglage d'éclairage qui fasse appel à des techniques numériques. Dans le système le plus récent, les réglages sont conçus pour correspondre de près aux méthodes traditionnelles adoptées dans le théâtre; en outre, le système présente tous les avantages du réglage électronique, et il peut être utilisé dans n'importe quelle position convenable. Les supports de mémoire peuvent présenter certains problèmes, notamment l'extraction des "repères" dans un ordre aléatoire à partir de la mémoire. L'utilisation du disque souple dans ce système a résolu le problème et augmenté la capacité de stockage; Q-Master 2000 représente ainsi un moyen technologique moderne de résoudre bon nombre des difficultés qui se présentent dans l'éclairage des scènes.

SOURCES LUMINEUSES POUR APPLICATIONS PHOTO-CHIMIQUES 27
P. T. Anstee et G. J. Beeson

Thorn Lighting produit une série de lampes spéciales pour applications photo-chimiques. Ces lampes sont utilisées en photographie classique et en travaux de reproduction, et aussi dans les procédés tels que la fabrication de clichés, le séchage des encres, le durcissement de la peinture, du vernis et de la résine.

La photographie en couleur exige des lampes produisant un spectre continu; on voit très peu de lampes à arc au charbon utilisées aujourd'hui pour la reproduction photographique. Par contre, on se sert actuellement de lampes au tungstène-halogène, au xénon pulsé et, plus récemment encore, de lampes à iodures métalliques.

Il est possible d'accélérer la polymérisation, une réaction photo-chimique créée par l'absorption de rayons ultraviolets. A cet effet, on ajoute des photo-initiateurs et l'irradiation de sources d'ultravidet ou de lumière violette. La polymérisation sert dans la préparation de clichés en relief, et on s'en est récemment servi pour le séchage des encres, des lampes aux iodures métalliques spéciales étant fixées à une presse d'imprimerie. Une nouvelle lampe Thorn désignée Graph-X, est utilisée pour le durcissement de la résine IC! "Impolex K" pour matières plastiques verre-résine: le durcissement s'effectue jusqu'à ce qu'il soit irradié par cette lampe.

Des progrès considérables ont été enregistrés dans ce domaine, et il est probable qu'ils se poursuivront.

In diese Ausgabe.

NOTBELEUCHTUNG 2
von S. A. Doo

Endlich wurde eine nationale Norm der Notbeleuchtung in Großbritannien durch die Veröffentlichung des BS.5266 ermöglicht, eines Regelbuches für die Notbeleuchtung von Lokalen und Räumlichkeiten.

Es wurde eine minimale Beleuchtungsstärke von 0.2 Lux mit einem Unterschadungsfaktor von 40:1 festgelegt. Diese gestattet es, die hervorstechendsten Punkte, wie Ausänge, Treppen, Feuerlöschgerätstellen usw., auf Pegel von 20 Lux zu erleuchten.

Die Feuerwehr wird eine schriftliche Garantie fordern, daß die Installationen einer Mindestnorm entsprechen, die endgültige Verantwortung trägt aber der Besitzer oder Bewohner.

Um sicherzustellen, daß die minimale Beleuchtungsstärke auf den Fluchtwegen immer erzielt wird, empfehlen wir einfache Planungsverfahren mit Isolux-Diagrammen. Leuchten können von zentralen Batterien aus betrieben werden (Tochtersysteme) oder in sich abgeschlossen sein, d.h. Aktion sie erhalten ihre eigenen aufladbaren Batterien und treten in falls der Strom in der Schaltung versagt, aus der sie versorgt werden. Diese Methode besitzt die Vorteile der Einfachheit und einer höheren Empfindlichkeit als das Tochtersystem. Eine grundlegende Forderung des BS.5266 ist regelmäßige Kontrolle.

In einigen Fällen können Reserve-Beleuchtungssysteme installiert werden, die genug Licht geben, um die Arbeit fortzusetzen; dies schaltet aber nicht die Notwendigkeit aus, Notbeleuchtungssysteme in allen Gebäuden zu installieren, zu denen die Öffentlichkeit Zutritt hat.

LICHT-DER SCHLAFLOSE WÄCHTER 6
von D. Wilkinson und R. G. Aldworth

Das einzige Sicherheitssystem, das auch abschreckend wirkt, ist eine gut geplante Beleuchtungsanlage. Sie erschwert es nicht nur den Dieben, sich unbemerkt anzunähern, sondern sie hilft auch dem wachpersonal, in Sicherheit zu Rundgänge zu machen, was die Arbeitsmoral erhöht. Diebstahl kostet die britische Industrie jährlich etwa 66 Millionen Pfund. Wo gute Sicherheits-vorkehrungen herrschen, sind die Versicherungsprämien niedrig.

Sicherheitsbeleuchtung ist aber nicht auf die Industrie beschränkt, denn Flutlichtbeleuchtung öffentlicher Gebäude trägt sowohl zu ihrem Schutz wie zu ihrem guten Aussehen bei.

Um vollständig abzuschrecken, muß die Beleuchtung die ganze Nacht aber angeschaltet bleiben. Einzäunungen sollen über ihre ganze Länge beleuchtet sein. Das Flutlicht soll gegen Eindringlinge scheinen und das Wachpersonal nicht blenden. Der Beleuchtungspegel in den Wachstuben muß niedrig sein, so daß der Wachmann sehen kann ohne gesehen zu werden. Beleuchtungskörper und Kabel müssen gegen Vandalismus gesichert sein. Falls Silizium-Fernsehkameras für Industriefernsehen eingesetzt werden, soll neben der Kamera zusätzliche Beleuchtung mit MBI- oder SON-Lampen verwendet werden; falls Infrarot-Kameras mit ihren eigenen Infrarot-Lichtquellen sowie mit allgemeiner Beleuchtung eingesetzt werden, ist die Wahl der Lichtquelle nicht beschränkt.

PROGRAMM 2 MACHT GUTE FORTSCHRITTE 9
von M. Pinniger und H. John

Die Bedeutung sorgfältiger Planung in den Anfangsstadien von Projekten mit Programm 2 wurde durch die im vergangenen Jahr gewonnenen Erfahrungen ins Licht gerückt. Einige interessante technische Fortschritte haben die Nützlichkeit und Vielseitigkeit des Systems erhöht.

Die Modifizierung der Neuformat-Leuchten, die jetzt anstelle von 20W Leuchtstofflampen 40W U-Röhren aufnehmen, führte trotz Kostenesenkung zu einer Erhöhung der Lichtleistung. Eine Anlage mit Stahlkassetten des Programms 2 ist fertiggestellt und das einzigartige lineare Luftteil zeigt seinen Wert, weil es bis zu 40% der Installationskosten für Zuluftverteilung einspart.

Eine Variente der linearen Metallkassette verwendet "Clipper" – Leuchten des Standardtyps in einem 1500 × 1500 mm Standard-Modul mit Abluftführung.

Programm 2 hat gezeigt, daß es modifiziert werden kann, um einem anderen Modul zu entsprechen, wobei nur die Metallkassetten eine verschiedene Bearbeitung verlangen. Wenn die Oberflächenendfertigung verbessert wird, kann das System auch in nur halb geschützter Umgebung eingesetzt werden. Wenn nötig, kann sogar der Stützraster modifiziert werden, und dies geschah in einer Anlage, die 3200 × 1400 mm Kassetten mit 1800 mm 85W Leuchstofflampen verlangte.

BELEUCHTUNG DES FUSSBALLSTADIUMS "VICENTE CALDERÓN" IN MADRID 12
von P. W. J. Holley

Das herrliche Stadium des Club Atletico in Madrid wurde für die Austragung der Weltmeisterschaft in Jahre 1982 ausgewäht gewahlt und war heuer die Szene des Treffens zwischen Spanien und der Bindesrepublik Deutchland im Viertelfinale um den Pokal der Europäischen Nationen. Ehe dieses spiel ausgetragen werden konnte, mußte die Beleuchtungsanlage auf den internationalen Standard für Farbfernsehen gebracht werden. Thorn Lighting's in Spanien vertritt, C. & G. Carandini, erhielt den Auftrag wobei Vertrétnung das bestehenden Gerüste und die Flutlichtstellungen an der Vorderseite des Tribunendaches beibehalten werden sollten.

Der Vertrag wurde am 10. März unterschrieben, und schon am folgenden Tage wurden 320 Thorn ON 1600 Scheinwerfer nach Madrid gesandt. In der Zwischenzeit entwarf der Beratungsdienst der internationalen Abteilung von Thorn den Plan in allen Einzelheiten, wozu auch der Computer-Dienst in Leicester herangezogen wurde. Als die Bestatignung der Scheinwerferstellungen eintrat, war die alte Ausrüstung schon entfernt worden und die Neu-Installierung hatte begonnen. Die neue Anlage sollte eine Beleuchtungsstärke von 1600 Lux in einer Ebene senkrecht zur Stellung der wichtigsten Fernsehkamera erzielen, um den Farbfernsehanforderungen der Spanien und der UEFA zu entsprechen. Sie erzielte eine Erhöhung der Beleuchtungsstärke um 314% gegenüber der ursprünglichen Anlage bei einer Senkung des Stromverbrauche um 16%.

Die Anlage war am 7. April fertig, 28 Tage nach Erhalt des Auftrages und rechtzeitig, um ein Spiel zwischen Atletico und einem lokalen Team zu beleuchten. Dieser Erfolg half C. & G. Carandini, Verträge für Badajoz und Almeira abzuschließen.

MINIATUR - HALOGENLAMPEN 16
von A. G. Buchannan

Miniatur Halogenlampen wurden zum ersten Mal im Jahr 1963 von Thorn angekündigt, und seither wurde die Auswahl auf eine Reihe von Anwendungszwecken erweitert.

Diese sehr kleinen einseitig gesockelter Lampen sparen nicht nur Raum, sondern gestatten auch ein sehr genaues Fokussieren von optischen Systemen. Wegen ihrer geringen Größe stellt die Wärmestreuung ein Problem dar sodaß Kühlkörper und keramische Fassungen werden notwendig.

Eine der ersten Anwendungsbereich der 6V/10W M29 Lampe war in Verkehrsampeln, wo die kleine Größe und hohe Effizionz die Schwierigkeit schlechter Sichtbarkeit in hellem Sonnenlicht vollständig überwand. Andere Lampentypen, wie die 24V 250W M36 werden in Projektoren für Spezialeffekte eingesetzt und die 12V 20W M35 Lampe wird bei ihrer Verwendung in Mastteplatemen von Yachten gezeigt.

In integralen Spiegelsystemen befestigte Lampen werden weitgehend in Faseroptikanwendungen eingesetzt, von beleuchteten Verkehrszeichen auf Autobahnen bis zu dekorativen Schaustellungen. Um das Schmelzen er Faserenden zu vermeiden, werden dichroitische Spiegel bei den stärkeren Lampen eingesetzt.

Lampen dieser Art werden in den Signalsystemen zwischen Kust und Schiff "IDASAT" verwendet, die beim Festmachen von Super-tankern eingesetzt werden. Annäherungsgeschwindigkeiten werden durch Blinksignale angezeigt und der Abstand von der Mole durch die Länge von horizontalen Licht-Bändern. Anlegezeiten der Schiffe können bis auf eine halbe Stunde verringert werden, und das System ist jetzt in den wichtigsten Häfen für Öl und Erze in der ganzen Welt installiert.

Man kann vertrauens voll voraussagen, daß bei Konstruktion und bei der Anwendung dieser Lampen noch große Fortschritte erzielt werden.

EINE NEUE' SCHLANKE 40W, 1050mm LEUCHTSTOFFRÖHRE 22
von G. V. McNeill

Die vor 40 Jahren eingeführte 1200 mm lange 40W Standard-Leuchtstoffröhre erwies sich als zu lang, für einen 1200 mm Modulardeckenrost so daß eine kürzere Röhre mit demselben Nennwert wurde vom Internationalen Normkomittee (IEC81) für Leuchtstoffröhren untersuch wurde.

Obwohl einige Mitgliedsstaaten eine 1165 mm Röhre bevorzugten, verlangte die Mehrzahl eine kürzere Röhre, die Hindernissen im Modularraum Rechnung trug.

Man einigte sich auf eine Röhrenlänge von 1047 mm von Endfläche zu Endfläche der Lampe. Es wurden zuerst 133 mm vom 1200 mm Modularraum abgezogen und dann 10 mm für die Dicke der Lampenhalter hinzugefügt.

Beim Vergleich zweier Modelle einer nominell 1050 mm 40W Lampe mit ungefähr derselben Lumenleistung wie die bestehende 1200 mm 40W Röhre, eines aus Glasrohr mit einem Durchmesser von 38 mm (T12) und das andere aus 25 mm Glasrohr (T8), zeigte es sich, daß die Röhre mit dem kleineren Durchmesser leistungsfähiger war und von einem 40W Standard-Vorschaltgerät betrieben werden konnte.

Diese, Rohre die 40W U-Röhre (eine zu einem U gebogene T8 1050 mm Röhre) und der 1800 mm 75/85W Röhre vervollständigen die Thorn-Reihe metrischer Leuchtstoffröhren.

FLOPPY DISC UND Q-MASTER 24
von E. A. Stanley

Theater-und Fernsehstudioinszenierungen fordern immer mehr verfeinerte Lichtsteuer systeme, um den für die verschiedenen Lichtstimming benötigten komplizierten Beleuchtungswechsel durchzuführen. Einige der uberlegingen Entwurf beim und der Entwicklung solcher Systeme werden in diesem Beitrag beschrieben und die Entwicklung des 'Q-master' aus 'Q-file', der ersten Licht steuerung Digitalverfahren wird skizziert. Obwohl in dem neuesten System die Stenerung stark dem traditionellen Theatergebrauch entsprechen soll, besitzt es alle Vorteile elektronischer Regelung und kann an jeder geeigneten Stelle eingesetzt werden. Speicher werfen bestimmte Probleme auf, nicht zuletzt das der beliebigen Ausgabe von Bildstimmungen aus einem Speicher. Die Verwendung eines elastischen Plattenlaufwerkes in diesem System löste dieses Problem und vergrößerte den Speicherraum, so daß der 'Q-Master 2000' ein modernes technisches Mittel zur Uberwindung der vielen Schwierigkeiten darstellt, auf die der Bühnenbeleuchter trifft.

LICHTQUELLEN FÜR FOTOCHEMISCHE ZWECKE 27
P. T. Anstee und G. J. Beeson

Thorn Lighting bringt eine Reihe von Spezaillampen für Anwendungen in der Fotochemie auf den Markt, Diese worden für herkömmliche fotografische Verfahren und Vervielfältigungen wie auch für Verfahren wie die Herstellung von Platten, das Trocknen von Drucken, Anstriche, Lacke und die Aushärtung von Harzen verwendet.

Die Farbfotografie fordert Lampen mit kontinuierlichem Spektrum; heute trifft man in der Reprografie selten auf Kohlenbogenlampen, dagegen werden Halogenlampen, Impulsxenon- und in jüngster Zeit Metallhalogenidlampen eingesetzt.

Polymerisation, eine fotochemische Reaktion, die durch die Absorption von ultra-violetter Strahlung erreicht wird, kann durch den Zusatz von Fotoinitiatoren und Strahlung aus Quellen ultra-violetten und violetten Lichtes beschleunigt werden. Sie wird bei der Herstellung von Reliefbildplatten verwendet und wurde jüngst auf das Trocknen von Druckfarben ausgedehnt, Wobei spezielle Metallhalogenidlampen an der Druckerpresse angebracht werden. Eine neue Thorn-Lampe, die Graph-X, wird in der Erzeugung von glasfaserverstärkten Kunststoffen zur Aushartung des ICI-Harzes "Impolex K" eingesetzt: Aushärtung tritt erst ein wenn die Bestrahlung durch diese Lampe beginnt.

Auf diesem Feld wurden große Fortschritte gemacht, und diese Entwicklung wird sich fortsetzen.

En esta edición.

ILUMINACION PARA SALIDAS DE EMERGENCIA 2
S. A. Doo

Una norma nacional para practica de iluminación de emergencias en el Reino Unido es finalmente posible por la publicación de BS.5266 – Código de Práctica para Iluminación de Emergencia en Recintos.

Es determinada una iluminación mínima de 0,2 Lux proyectada con factor diversidad de 40:1. Lo cual permite iluminar con nivel de 20 Lux puntos estrategicos tales como salidas, escaleras emplazamientos de matafuegos, etc.

Funcionarios seguridad contra incendios demandarán garantía escrita que las instalaciones conforman con las normas mínimas, pero responsabilidad final recae sobre el propietario o el ocupante.

Son recomendados simples métodos de planificación utilizando diagramas Isolux para asegurar lograr siempre iluminación mínima sobre rutas de escape. Las luces pueden ser operadas desde acumuladores centrales (sistemas subordinados) o ser auto-contenidas integrales, incorporando sus propias baterias recargables y entrando en operación si fallare energia en el circuito que las alimenta. Este método tiene ventajas por simplicidad y mayor sensitividad sobre el sistema subordinado. Comprobación regularizada es requerimiento fundamental de BS.5266.

En algunos casos pueden existir instalados sistemas lumínicos de reserva proyectando luz suficiente para continuar trabajo, pero esto no precluye la necesidad de sistemas de iluminación para salidas de emergencia en cualquier edificio donde sea admitido el público.

LUZ, EL GUARDIAN INFATIGABLE 6
D. Wilkinson y R. G. Aldworth

Iluminación buena, correctamente diseñada es el unico sistema de seguridad que actua además como disuasivo. No sólo impide ingreso inobservado del intruso pero también asiste patrullaje de vigilancia con seguridad, mejorando así la moral general. El costo anual por robos en la industria Britanica es de unos 66 millones de libras esterlinas, las primas del Seguro son menores donde existen evidencias de buena protección.

Iluminación para seguridad no sólo es aplicada par a industrias, la iluminación proyectada sobre edificios públicos realza su seguridad tanto como su presentación.

Para poder actuar totalmente como disuasivo la iluminación debe continuar encendida durante la noche entera. Cercos perimetrales han de ser iluminados en toda su extensión. Proyectores de luz deberán ser enfocados hacia los intrusos evitando encandilar los vigilantes. Niveles de intensidad lumínica en albergues para vigilancia deberán mantenerse bajos permitiendo visión al exterior por los guardianes sin ser estos visibles y tanto equipos como cableado de iluminación deben ser totalmente a prueba de vandalismo. Si son utilizadas cámaras a silicón para sistemas de televisión en circuito cerrado, es recomendable utilizar iluminación suplementaria con lámparas MBI o SON en el emplazamiento de la cámera. Donde son utilizadas cámeras del tipo infrarojo con sus propias fuentes de rayos I-R, así como iluminación general, no existen restricciones sobre selección de fuente lumínica.

SYSTEMA PROGRAMA 2 LOGRA BUEN PROGRESO 9
M. Pinniger y H. John

La importancia de planificación esmerada en las etapas iniciales de proyectos Programa 2 ha sido comprobada en las experiencias del año transcurrido. Algunos desarrollos técnicos de interés han aumentado la utilidad y versatilidad del sistema.

La modificación de luminarias New Format para aceptar tubos – U de 40 vatios, en lugar de dos tubos rectos 20 vatios, ha llevado a un incremento en luz emitida mientras reduce el costo.

Ha sido completada una instalación de cofres de acero en Programa 2 y la barrera lineal unica de aire va probando su valor, al ahorrar hasta un 40% en costos instalados para difusión etérea.

Una variante del cofre lineal utiliza luminarias "Clipper" normales emplazados en unidad modular normal 1500 × 1500 mm con facilidades caudal de aire.

El Programa 2 ha demostrado capacidad de adaptación para aceptar diferentes unidades modulares, requiriendo sólo los cofres herramental especial. Con mejoras en la norma de acabado superficial, el sistema puede asimismo ser utilizado en situaciones semi-expuestas. De ser requerido, hasta la vejilla soporte puede ser modificada, lo cual se ha efectuado en una instalación que necesitó cofres de 3200 × 1400 mm alojando 4 tubos fluorescentes de 85 vatios en 1800 mm.

ILUMINACION DEL ESTADIO VICENTE CALDERÓN EN MADRID 12
P. W. J. Holley

El magnífico estadio Vicente Calderón en Madrid ha sido seleccionado para la Serie Copa Mundial de 1982 y fué la sede del partido entre España y Alemania Occidental en las preparatorias de finales de la Copa Naciones Europeas durante el año actual. Antes de disputarse este partido debió ser llevada la iluminación instalada a normas internacionales para televisión de color. C. y G. Carandini, agente en España de Thorn Lighting, obtuvo el contrato aprovechando los emplazamientos y puente existente para focos sobre el frente del techado de la tribuna.

El contrato fué rubricado el día 10 de marzo, en la jornada siguiente fueron despachados a Madrid 320 Focos Proyectores Thorn ON 1600. Entretanto el Servicio Consultor División de Thorn Internacional planificó en detalle el programa utilizando el servicio de computadoras en Leicester. Al llegar confirmación de emplazamientos para los nuevos focos proyectores, los equipos antiguos habian ya sido eliminados e iniciados los trabajos para la nueva instalación, diseñada para ofrecer iluminación de 1600 Lux sobre un plano normal al emplazamiento principal de la cámara televisora, en conformidad con requerimientos Españoles y UEFA para televisión de color. Logró un aumento del 314% en iluminación sobre la instalación original con un 16% de reducción en la carga para iluminación.

La instalación fué completada el 7 de abril, a los 28 días de recepción de la orden y a tiempo para iluminar el partido entre Atlético y el equipo local disputado el 8 de abril. El éxito de la operación ha contribuido en la obtención por C y G. Carandini de contratos en Badajoz y Almería.

LAMPARAS MINIATURAS 16
A. G. Buchannan

Lámparas miniatura de tungsteno halogeno (cuarzo-iodo) fueron inicialmente lanzadas por Thorn en 1963, desde entonces su linea ha sido ampliada para servir una serie de aplicaciones.

Estas diminutas lámparas de casquillo unico no sólo ahorran espacio pero además permiten sistemas ópticos preenfocables de suma exactitud. Debido a su mínima dimensión, disipación térmica presenta problemas siendo necesario utilizar difusor de calor y portalámparas cerámicos.

Una de las primeras aplicaciones de la lámpara 6V 10W tipo M29 fué su empleo en samáforos de tránsito, donde su dimensión diminuta y elevada eficacia ha superado totalmente las dificultades de baja visibilidad en luz solar brillante. Lámparas de otros tipos, tales como la unidad 24V 250W tipo M36 son usadas para proyectores de efectos especiales y la lámpara 12V 20W tipo M35 es mostrada en uso como iluminador extremo del mastil para yates.

Lámparas incorporadas en sistemas con espejo integral son extensamente utilizadas en aplicaciones de fibra óptica que varian desde señalizado iluminado en autopistas hasta despliegues decorativos. Espejos dicroicos son empleados con lámparas de mayor potencia para evitar fusión de las extremidades de las fibras.

Lámparas de este tipo son utilizadas en el sistema de señalizado "IDASAT" de costa-a-navio empleado para asistir el atraque de supernaves banqueros. Velocidades de aproximación van indicadas por señales destellantes y distancias desde el muelle por la longitud aparente de barras horizontales iluminadas. Pueden disminuirse hasta una media hora los tiempos de atraque y el sistema es actualmente incorporado en todas las terminales petroleras y mineras importantes a través del mundo entero.

Es confiable pronosticar que muchos progresos adicionales han de ocurrir en el diseño y aplicaciones de estas lámparas.

NUEVO TUBO FLUORESCENTE 1050 mm DELGADO DE 40 VATIOS 22
G. V. McNeill

El tubo fluorescente normal de cuatro pies 1200 mm 40W, presentado hace unos 40 años, es demasiado largo para calzar dentro de una rejilla modular de 1200 mm aplicada al techo y se encuentra bajo consideración un tubo más corto de capacidad equivalente por el Comite Internacional de Normas para Lámparas Fluorescentes Tubulares.

Aunque algunas naciones adheridas favorecen un tubo de 1165 mm, la mayoría prefirió un tubo más corto que permitiera salvar obstrucciones en el espacio modular.

Se llegó finalmente a una longitud del tubo de 1047 mm desde frente a frente de la lámpara, al restar inicialmente 133 mm del espacio modular de 1200 mm y luego sumar 10 mm adicionales por el espesor de los portalámparas.

Comparación a lámparas nominales de 1050 mm 40W construidas en 38 mm (T12) o 25 mm (T8) diametrales del tubo vitreo para ofrecer aproximadamente la misma emisión lumínica que los tubos existentes de 1200 mm 40W, ha demostrado que el tubo de diámetro menor es más eficiente y puede ser operado desde una reactancia normal 40W.

Lo cual, con el tubo en – U – 40W (un tubo T8 1050 mm doblado en "U") y el tubo 75/85W de 1800 mm, completa la linea de tubos fluorescentes métricos de Thorn.

FLOPPY DISC Y Q-MASTER 24
E. A. Stanley

Producciones teatrales y en Estudios de TV exijan sistemas de control, de iluminación aumentando en sofisticación para producir complejos cambios en iluminación o indicación visual requerida

Algunas de estas consideraciones en diseño y desarrollo de tales sistemas son descriptas en este artículo que delinéa la evolución del programador maestro "Q-master" del archivo indicador Q file la primer forma de control de luces utilizando técnica digital. En el ultima sistema creado controles operativos van diseñados correspondiendo estrictamente con prácticas teatrales tradicionales, pero cuenta con todas las ventajas del control electrónico y puede ser empleado en cualquier posición conveniente. Los medios de almacenaje presentan ciertos problemas, sin contar la forma de extraer "interpretación" en orden fortuito desde la memoria. El empleo de una transmisión por disco flexible o "floppy disc" en este sistema ha resuelto el problema y aumentado el espacio para almacenaje, de manera que el Q-Master 2000 ofrece un moderno medio tecnológico para resolver muchas de las dificultades en diseño de iluminación del escenario.

FUENTES LUMINICAS PARA APLICACION FOTOQUIMICA 27
P. T. Anstee and G. J. Beeson

IluminaciónThorn produce una variadad de bombillas especiales para aplicación en fotoquímica, utilizandose estas tanto en fotografía convencional y trabajo reproductivo como en tales procesos como revelado de placas, secado de impresiones, cura de pinturas, lacas y resinas.

Fotografía de color requiere lámparas con un espectro continuo; el arco voltaico de carbon es hoy raramente visto en labores fotoreproductivas, siendo en su lugar empleadas lámparas de tungsteno halógeno, de Xenon pulsante y las más recientes de Mercurio Haloide.

Polimerización, una reacción fotoquímica causada por absorción de radiación Ultra Violeta, puede ser acelerada por adición de foto-iniciadores e irradiación desde fuentes de luz U.V. o violeta. Es utilizada en la preparación de placas con imagen en relieve y recientemente ha sido desarrollada para secado de tintas, para lo cual son incorporadas sobre la prensa impresora lámparas especiales de mercurio haloide. Una nueva lámpara Thorn, la unidad Graph-X, es empleada para polimerizar resina 'Impolex K' de Imperial Chemical Industries para plástico reforzado con fibra vitrea: no sucede ningún endurecido hasta recibir irradiado desde esta lámpara.

Considerable progreso se ha logrado en este campo con grandes posibilidades de aumento futuro.

In questa edizione.

ILLUMINAZIONE DI SICUREZZA 2
S. A. Doo

Una norma nazionale sui criteri di illuminazione di emergenza in U.K. è stata finalmente varata con la pubblicazione del Codice BS 5266—

Un illuminamento minimo di 0.2 lux è prescritto con un contrasto di 40 : 1. I vigili del fuoco chiedono una garanzia scritta che gli impianti siano in accordo con i valori minimi delle norme, ma la responsabilità finale è del proprietario o dell'inquilino.

Semplici metodi di progettazione basati su diagrammi isolux sono raccomandati per garantire che sulle scale di sicurezza esista sempre almeno l'illuminamento minimo.

Gli apparecchi possono essere alimentati da gruppi elettrogeni o alloggiare alcune batterie ricaricabili che entrano in funzione se viene meno la tensione normale di rete. Quest'ultimo metodo è preferibile per la maggiore semplicità e sensibilità. Controlli regolari sono un paragrafo fondamentale del Codice BS5266.

In alcuni casi sono tenuti pronti sistemi di illuminazione che danno luce sufficiente per lavorare da permettere che si continui ad installarli, ma ciò non impedisce che necessitino sistemi di illuminazione di sicurezza in ogni palazzo in cui è ammesso il pubblico.

LA LUCE, OSSERVATORE INSTANCABILE 6
D. Wilkinson e R. G. Aldworth

L'illuminazione ben progettata è l'unico sistema di sicurezza che agisce anche come deterrente. Non solo rende difficile per i ladri l'avvicinarsi indisturbatamente, ma aiuta i guardiani a fare la ronda con sicurezza, riducendo la delinquenza. Il costo annuale del furto all'industria britannica è circa 66 milioni di sterline. I premi di assicurazione sono più bassi ove esistono buone condizioni di sicurezza.

L'illuminazione di guardia non è solo limitata ai complessi industriali, ma anche agli edifici pubblici dei quali migliora sia la sicurezza che l'aspetto.

Per agire completamente come deterrente l'illuminazione dovrebbe durare tutta la notte.

I recinti periferici dovrebbero essere illuminati per tutta la loro estensione.

Gli apparecchi dovrebbero essere puntati verso gli intrusi e non abbagliare i guardiani.

I livelli di illuminamento nei posti di guardia dovrebbero essere tenuti bassi, cosicchè i guardiani possano osservare senza essere visti; sia gli apparecchi che i conduttori dovrebbero essere antivandalici.

Se si impiegano telecamere per televisione a circuito chiuso, si raccomanda di installare accanto alla telecamera una illuminazione ausiliare con lampade MBI e SON. Quando si usano telecamere a raggi infrarossi con le relative sorgenti, non ci sono restrizioni nella scelta del tipo di luce.

IL PROGRAMMA 2 FA BUONI PROGRESSI 9
M. Pinniger e H. John

L'importanza di un'accurata programmazione nella fase iniziale dei progetti inerenti il Programma 2 si è capita dopo le esperienze del passato. Alcuni interessanti progressi tecnici hanno aumentato l'utilità e la versatilità del sistema.

La modifica dell'apparecchio New Format per adattarlo alle lampade da 40W a U anzichè le 20W 600 mm ha portato un aumento di flusso luminoso con una diminuzione di costo.

Un'installazione di pannelli d'acciaio Programma 2 è stata ultimata e un'unica barra aerea lineare è la prova della sua praticità, consentendo un risparmio fino al 40% dei costi di diffusione dell'aria installata.

Una variante del pannello lineare usa apparecchi "Clipper" normali situati in un modulo standard 1500 × 1500 mm con possibilità di regolare l'aria.

Il Programma 2 ha mostrato che può essere adattato in un modulo diverso, solo i pannelli richiedono di essere ritoccati. Con un aumento delle prestazioni della finitura superficiale, il sistema può anche essere usato in situazioni semi-esposte. Perfino la griglia di supporto può essere modificata se richiesto, e ciò è stato fatto in un'installazione che richiede per pannelli 3200 × 1400 mm lampade 85W 1800 mm.

ILLUMINAZIONE STADIO VICENTE CALDERÓN DI MADRID 12
P. W. J. Holley

Il magnifico stadio del Club Atletico di Madrid è stato scelto per il campionato mondiale del 1982 ed ha ospitato l'incontro Spagna-Germania Ovest nel campionato europeo di quest'anno. Prima di questa partita fu fatta l'installazione dell'impianto di illuminazione che si dovette adattare alle prescrizioni internazionali per la TV a colori. L'agente Thorn in Spagna, C & G Carandini, ottenne il contratto usando le torri esistenti e i supporti dei proiettori sulla tettoia delle tribune.

Il contratto fu firmato il 10 marzo; il giorno seguente furono spediti a Madrid 320 proiettori ON 1600. Contemporaneamente il servizio di consulenza della Thorn International Division elaborò il progetto dettagliatamente servendosi del calcolatore elettronico di Leciester. Le posizioni dei proiettori furono confermate, il vecchio impianto fu tolto e inizio il lavoro per la nuova installazione, progettata per dare un illuminamento di 1600 lux sul piano normale alla posizione della telecamera principale, in conformità con le norme spagnole e UEFA per la TV a colori. Aumento l'illuminamento del 314% rispetto l'installazione originaria, con una riduzione del 16% del carico elettrico.

L'installazione fu completata il 7 aprile, 28 giorni dopo l'ordine, in tempo per illuminare una partita tra Atletico e una squadra locale l'8 aprile.

Il suo successo portò alla C & G Carandini vantaggiosi contratti a Badajoz e ad Almeira.

LAMPADE MINIATURIZZATE 16
A. G. Buchannan

Le lampade miniatura ad alogeno furono inizialmente introdotte dalla Thorn nel 1963, e via la gamma è stata estesa per coprire un certo numero di applicazioni.

Queste piccole lampade ad attacco singolo non solo risparmiano spazio, ma anche permettono accurate prefocalizzazioni di sistemi ottici. Per la loro dimensione ridotta, la dispersione del calore rappresenta un problema e sono necessari portalampade in ceramica e fori di smaltimento termico.

Una delle prime applicazioni della M29 6V 10W fu il suo uso nella segnaletica stradale dove le sue dimensioni ridotte e l'alta efficienza vincono completamente la difficoltà della poca visibilità alla luce viva del sole.

Altri tipi di lampade come la M36 24V 250W sono usati in proiettori ad effetti speciali e la M35 12V 20W è consigliata per l'impiego nei fanali per yachts.

Le lampade installate in sistemi di specchi integrali sono assai usate in applicazioni con fibre ottiche che vanno dalle insegne luminose sulle autostrade alle sale di esposizione.

Specchi dicroici sono usati con le lampade più potenti per evitare lo scioglimento delle estremità delle fibre.

Lampade di questo tipo sono usate nel sistema segnaletico portuale "IDASAT" per l'assistenza nell'ancoraggio di navi-cisterne. Le velocità di avvicinamento sono indicate da segnali intermittenti e le distanze dal molo dalla lunghezza apparente di barre orizzontali luminose.

I tempi di attracco possono essere ridotti a mezz'ora ed il sistema è ora installato in tutto il mondo nei maggiori terminali portuali per petroli e minerali.

Si può sicuramente prevedere che ci saranno molti altri progressi nella progettazione e nell'applicazione di queste lampade.

UNA NUOVA LAMPADA FLUORESCENTE DA 40W—1050MM—TIPO T8 22
G. V. McNeill

La lampada fluorescente 40W 1200 mm, introdotta circa 40 anni fa, è troppo lunga per essere installata in un controsoffitto con moduli da 1200 mm ed una lampada più piccola di equivalente potenza è attualmente presa in considerazione dalla Commissione Internazionale delle lampade tubolari fluorescenti.

Sebbene alcuni paesi membri preferissero un tipo da 1165 mm, la maggioranza ne volle uno più corto per tener conto degli impedimenti nello spazio modulare.

Una lampada fluorescente di 1047 mm da faccia a faccia venne realizzata, togliendo prima 133 mm dai 1200 mm dello spazio modulare e poi altri 10 mm per lo spessore del portalampade.

Dal confronto tra le lampade 40W–1050 mm nei diametri 38 mm (T12) o 25 mm (T8) per dare approssimativamente lo stesso flusso del tipo 1200 mm 40W risultò che la lampada a diametro più piccolo era più efficiente e poteva essere alimentata da un reattore da 40W standard.

Questo modello, con il tipo da 40W ad U (una lampada T8–1050 mm curvata ad "U") e la 1800 mm 85W, completa la gamma Thorn di lampade fluorescenti metriche.

IL "FLOPPY DISC" 24
E. A. Stanley

Le rappresentazioni teatrali e le riprese televisive richiedono sistemi di controllo della luce sempre più sofisticati per avere complessi cambiamenti di illuminazione. Alcune considerazioni sulla progettazione e sullo sviluppo di tali sistemi sono spiegate nel presente articolo con cui si descrive l'evoluzione del Q-master dal Q-file, primo sistema di controllo luminoso con l'uso di tecniche digitali.

In tale sistema i controlli relativi alle operazioni sono progettati in modo che corrispondano strettamente alla norma teatrale tradizionale, ma esso ha tutti i vantaggi del controllo elettronico e può essere usato in qualunque posizione idonea.

La memorizzazione dei dati presenta alcuni problemi, non ultimo quello dell'estrazione a caso di "segnali" dalla memoria. L'uso della guida a disco flessibile o "floppy disc" nel presente sistema ha risolto questo problema e aumentato lo spazio di memorizzazione, tanto che il Q-Master 2000 fornisce un mezzo tecnologicamente moderno per eliminare molte delle difficoltà di progettazione nella illuminazione teatrale.

SORGENTI LUMINOSE PER APPLICAZIONI FOTOCHIMICHE 27
P. T. Anstee e G. J. Beeson

La Thorn Lighting produce alcuni tipi di lampade per applicazioni foto-chimiche; queste sono usate nei comuni lavori di fotografia e di riproduzione in taluni procedimenti come esecuzione di cliché, asciugatura di stampe, colori, vernici e vulcanizzazione resine.

La fotografia a colori richiede lampade con uno spettro continuo; oggi l'arco di carbone è poco usato nel lavoro di fotoriproduzione; ora si usano lampade ad alogeno, ad impulsi allo xenon e ad alogenuri metallici.

La polimerizzazione, una reazione foto-chimica generata dall'assorbimento di radiazioni ultraviolette, può essere accelerata con l'aggiunta di foto-iniziatori e con l'irradiazione di raggi ultravioletti.

E' usata nella preparazione di cliché tipografici ed è stata recentemente estesa all'essicazione di inchiostri per la quale delle speciali lampade ad alogenuri metallici vengono applicate alla pressa tipografica.

Una nuova lampada Thorn, la Graph-X, è usata per vulcanizzare la resina ICI "Impolex K" per plastica rinforzata con vetro: finchè c'è irradiazione da questa lampada non avviene alcun indurimento.

In questo campo sono stati fatti molti progressi e ne è auspicabile un proseguimento.

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